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SECTION I

AIR

1. JUNKERS 52

The Junkers 52 which first made its appearance as a commercial plane in 1931 was designed with a view to its ultimate conversion to a bomber. It was one of the most widely used types on German airlines and was also operated in Belgium, Holland, Austria, Denmark, Sweden, Norway, Finland, and several South American countries. Military versions of the Ju-52 equipped the bomber squadrons of the Luftwaffe in 1935 and remained as the standard heavy bomber in company with the Ju-86 until 1937. Ju-52's were used extensively in the early days of the Spanish Civil War and were also employed in the attack on Rotterdam. The bomber model was outdated by faster bombers at the outbreak of the war, and the aircraft was put into service as a troop and freight carrier and is still being produced for this purpose. Several guns have been added to transform it into an armed transport. The original passenger cabin is a bare storage compartment with broad entrance and exit hatches from which paratroopers can jump, and through which reserve supplies are dropped to the fighting troops. It has glider-towing fittings incorporated into the tail and is frequently used as a glider tug.

The Ju-52 is a three-engined low-wing monoplane with cantilever wings and semi-cantilever stabilizer, the latter being braced to the fuselage with a single strut on either side. The span is 95 feet 11 inches and the length 62 feet. It is of all-metal construction, with a deep rectangular fuselage, a fixed landing gear, and air-cooled radial engines, one in the nose, and the other two in nacelles in the wings outboard of the landing gear. A distinctive feature is the use of corrugated metal for wing and fuselage covering. The so-called Junkers "double-wing" is employed. The inner portions vary the camber; the outer portions act differentially as ailerons. There is a single fin and rudder. This plane may be equipped with floats for sea operations or skis for winter flying.

The engines consist of three B.M.W. 132 A or T air-cooled 9-cylinder radials, each developing 660 hp at sea level. The maximum speed of the Ju-52 is 170 mph at 4,500 feet; 165 mph at sea level. The cruising speed is 132 mph at sea level. The service ceiling is 16,000 feet with maximum load, 21,000 feet at finish. The normal range is 530 miles with a 5,000 pound load, or 790 miles with maximum fuel and a 4,000 pound load. The normal fuel load is 436 U.S. gallons, with a possible maximum of 645 U.S. gallons.

The armament varies, but the maximum so far found consists of four MG 15 7.92-mm machine guns. Reports have been received that 20-mm cannons are being used, but to date no aircraft with this armament have been found. The most usual combination on the freight version consists of one upper-rear MG 15 machine gun in a ring mounting, one lower-rear MG 15 machine gun in the retractable "dust bin", and two lateral machine guns firing out of the windows on each side aft of the wing. Occasionally, one of the machine guns has been found mounted as an upper-front gun, in a perspex dome over the second pilot's seat on the right-hand side of the cockpit.

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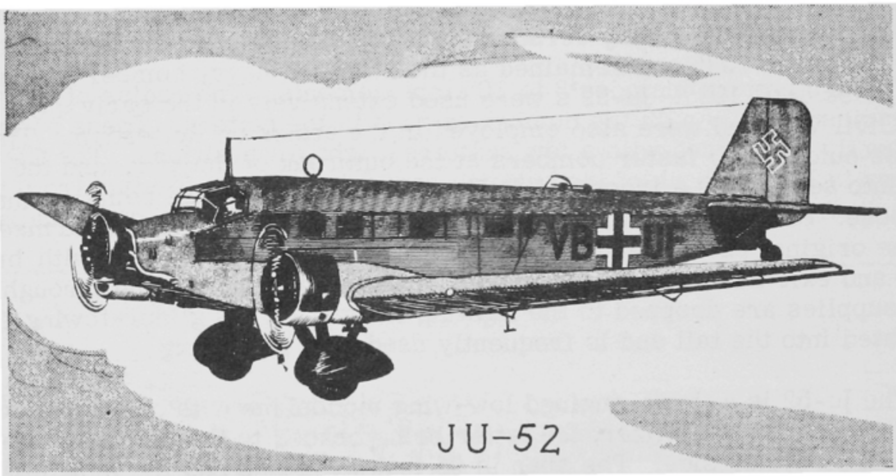
The crew ordinarily consists of three, a pilot, a co-pilot, and a radio operator, the latter two manning the guns. When used as a troop transport, there is a fourth member who combines the duties of rear-gunner and checker of the parachutists and their equipment.



JU-52

The official German maintenance handbook for the Ju-52 lists no fewer than 37 different uses and loadings, of which the following are examples:

1. Troop transport -- carries 15 to 20 fully-equipped men
2. Freight transport -- maximum pay-load, 5,260 lbs
3. Ambulance aircraft -- accomodation for 12 stretchers
4. Parachute troop carrier -- 12 fully-equipped men
5. Glider tug -- can normally tow one Go-242 with 23 men or 3 small gliders carrying 10 to 12 men each
6. Flying classroom -- especially for training in night flying.

Throughout the African campaign this aircraft has been extensively used for transporting troops, munitions and supplies of every kind from Italy and Sicily to Africa. During the height of the Tunisian campaign, from 50 to 150 per day were running a shuttle service across the Mediterranean, carrying on the return trip wounded men from Africa. Wherever possible, fighter escort is provided because the Ju-52 lacks speed, armor, and adequate armament. This accounts for the high attrition rate of this aircraft in all operations.

ANTIAIRCRAFT

2. JAPANESE ANTIAIRCRAFT GUN INSTALLATIONS

A study by the official U.S. Navy Pacific Photo-Interpretation Unit of aerial photographs of Japanese occupied areas in the Solomon Islands, reveals that the

plan of enemy medium and heavy antiaircraft battery positions usually follows one of three patterns: that of an arc, a triangle, or a rectangle. A typical battery position is shown in figure 1.

a. Ground Patterns

(1) Arc Pattern

The arc pattern includes 3 to 10 emplacements. The radius of the arc usually varies directly with the number of guns in the pattern. These batteries are frequently reinforced with a few scattered light AA positions. The CP of the arc battery is located back of the battery, approximately equidistant from the ends (see figure 2). Gun crew quarters and ammunition dumps can usually be

FIG. I

observed at the edge of the clearings in which the batteries are installed. One noteworthy battery consists of a series of three arc patterns, the center one of the three being reversed in direction from the end two. This battery is located at Vila.

(2) Triangular Pattern

This is a three-gun installation in the shape of a triangle. The CP is usually located in the center of the position. It is similar to the arc and rectangular positions in all other respects (see figure 3).

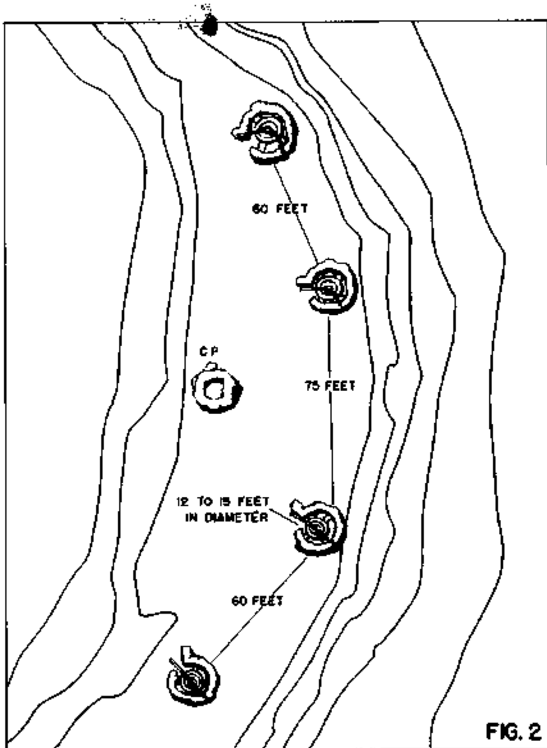


FIG. 2

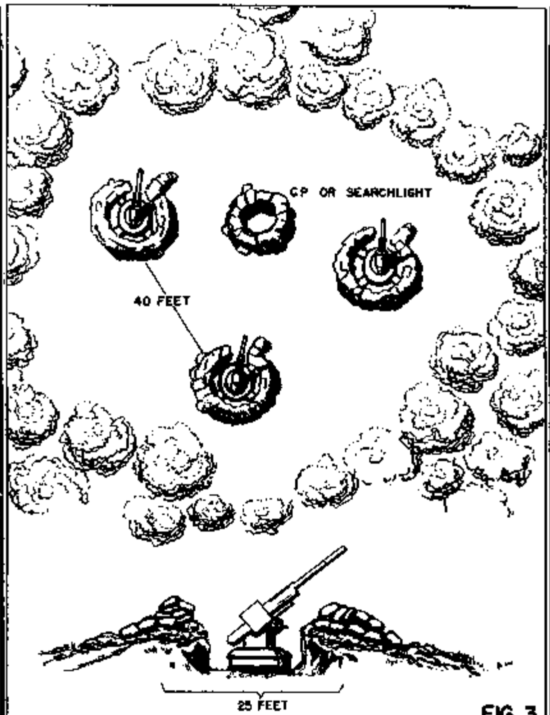


FIG. 3

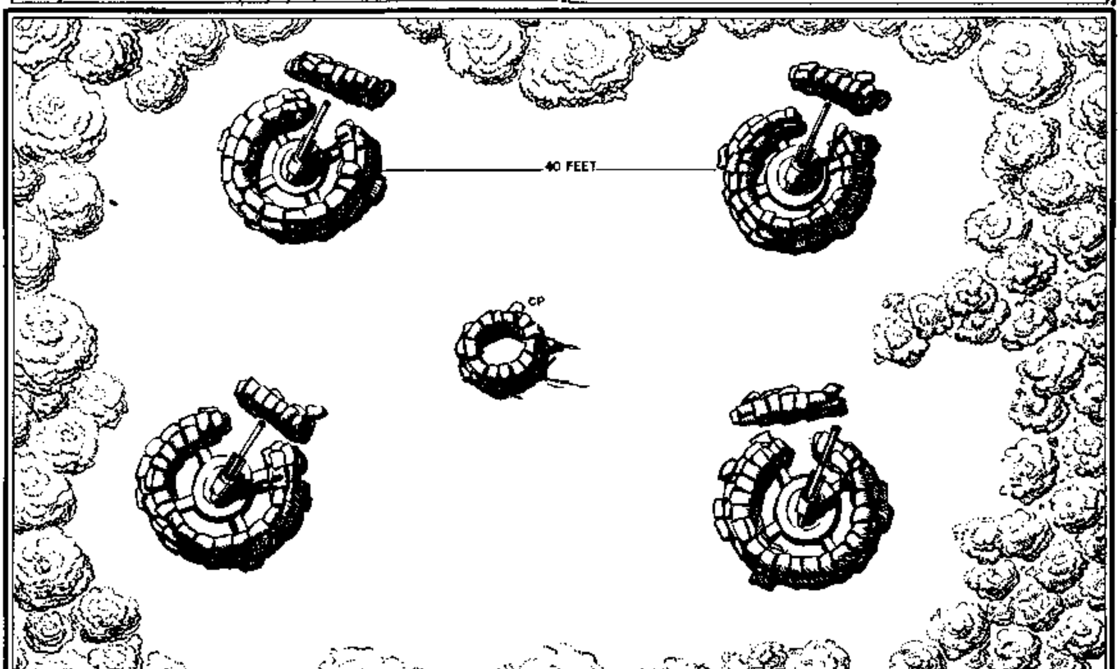


FIG. 4

(3) Rectangular Pattern

The rectangular position is a four-gun battery built in a roughly rectangular pattern. This pattern is more of a trapezoid but for purposes of classification, patterns of this type are classified as rectangular. This type of battery has a CP in the center of the position. Crew quarters, ammunition dumps, etc., are removed from the position as in the case of the arc pattern; if the position is in a clearing they are located at the edge of it (see figure 4).

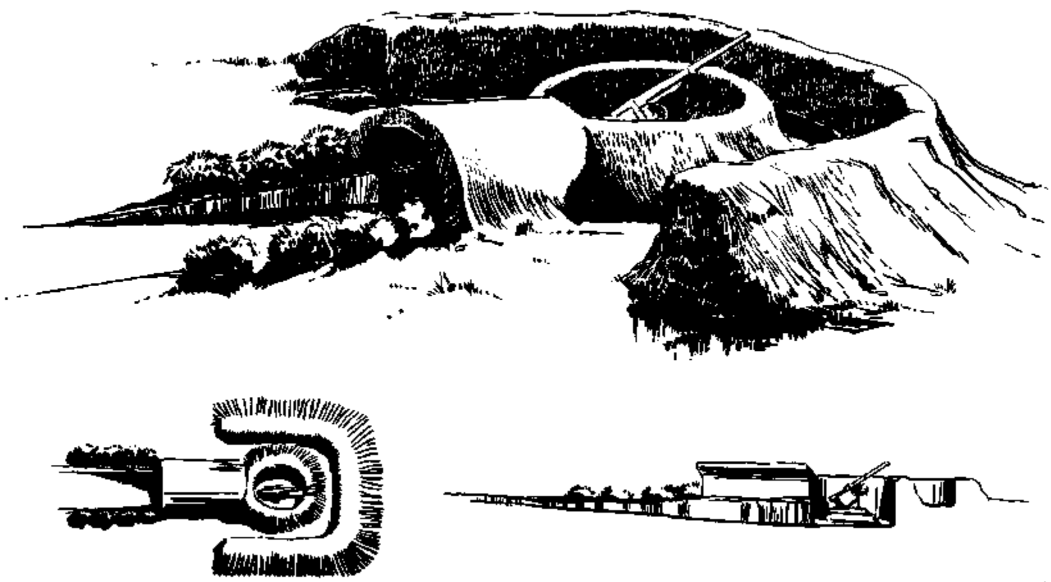


FIG. 5

b. Revetment Types

(1) Circular Revetment

The revetments that the Japs build are usually circular. In most instances they have no entrances. Some have been observed with a protected entrance, and a few with an unprotected gap. These revetments vary in size from 12 to 33 feet inside diameter. Most of them appear to be slightly countersunk. The revetment is probably built up of sandbags or some similar material (see figure 3).

(2) Modification of Circular Revetment

At Vila a new type revetment has been observed. This consists of a ramp leading down into the opening of a covered shelter, probably for ammunition storage, which in turn opens directly into a circular gun revetment. Another revet-

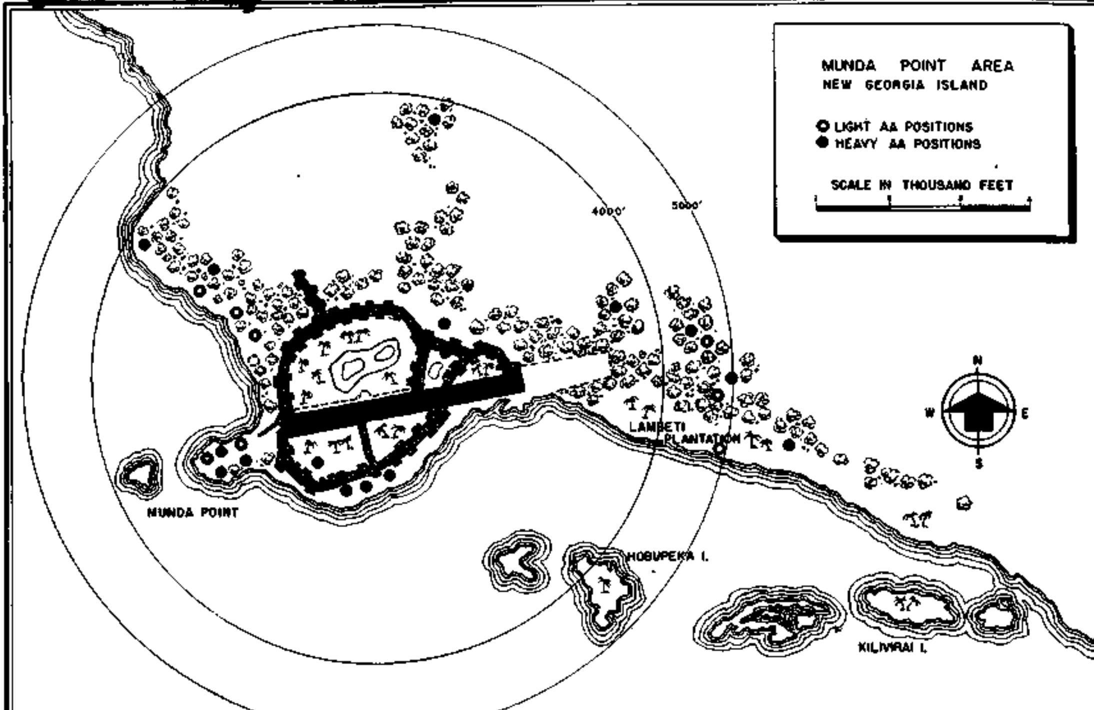

MUNDA POINT AREA
NEW GEORGIA ISLAND
LIGHT AA POSITIONS
HEAVY AA POSITIONS
SCALE IN THOUSAND FEET
4000'
5000'
LAMBETI PLANTATION
MUNDA POINT
HOBUPEKA I.
KILIVIRAI I.
N
W
E
S

FIG. 6

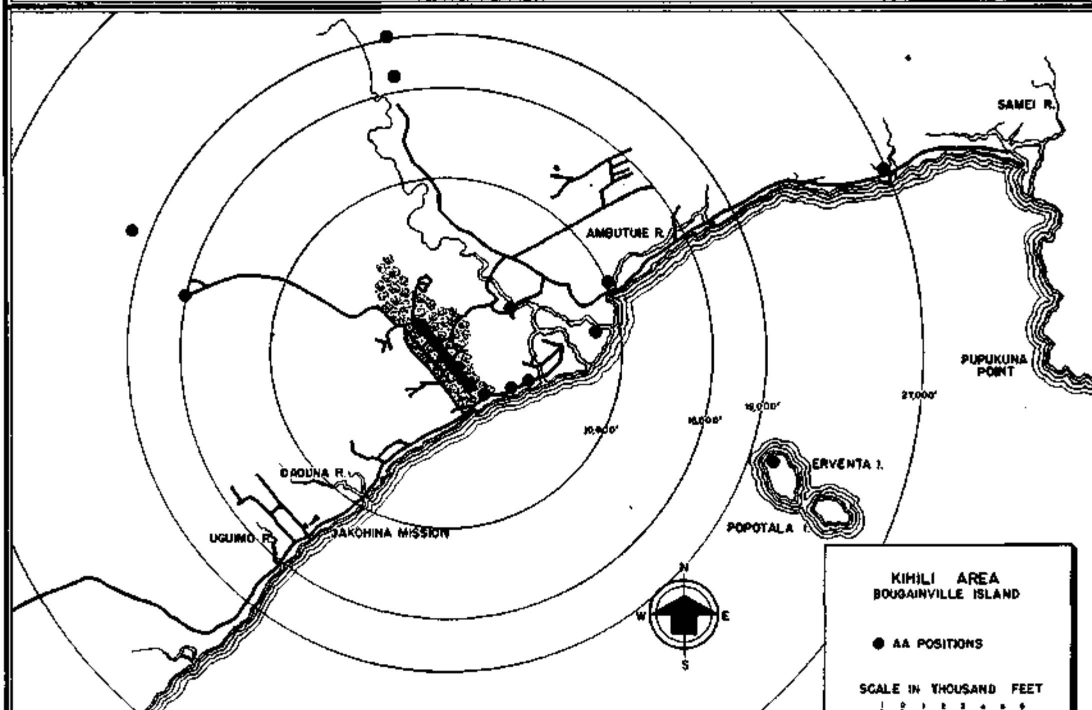

SAMEI R.
AMBUTUIE R.
PUPUKUNA POINT
27,000'
ERVENTA I.
DAOUNA R.
UGUIMO R.
JAKOHINA MISSION
POPOTALA I.
KIHILI AREA
BOUGAINVILLE ISLAND
AA POSITIONS
SCALE IN THOUSAND FEET
N
W
E
S

FIG. 7

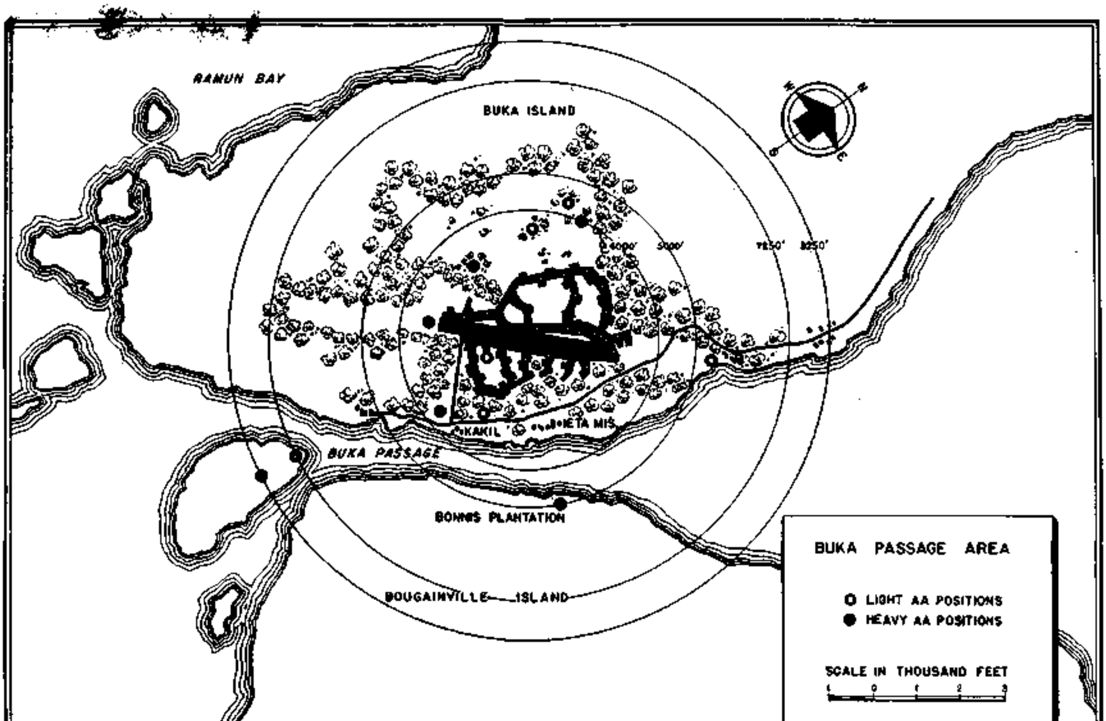

RAMUN BAY
BUKA ISLAND
4000'
5000'
7650'
8250'
KAKIL
BUKA PASSAGE
BONNIS PLANTATION
BOUGAINVILLE ISLAND
BUKA PASSAGE AREA
LIGHT AA POSITIONS
HEAVY AA POSITIONS
SCALE IN THOUSAND FEET

FIG. 8

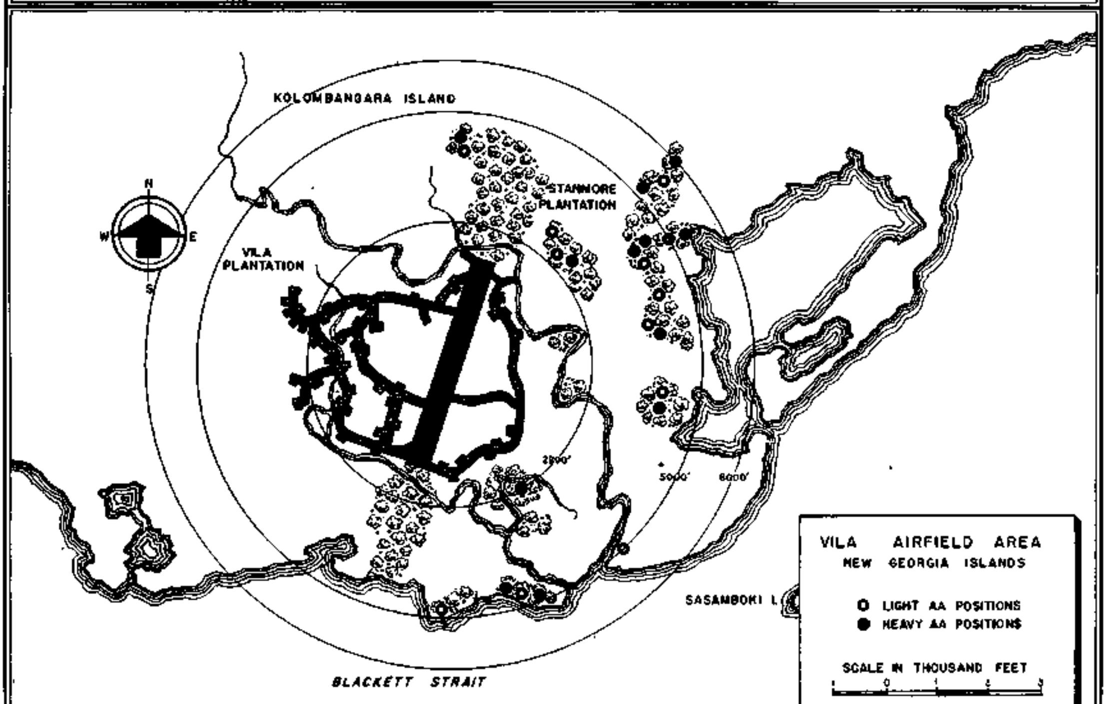

KOLOMBANGARA ISLAND
STANMORE PLANTATION
VILA PLANTATION
N
W
E
S
2000'
5000'
6000'
SASAMBOKI I.
BLACKETT STRAIT
VILA AIRFIELD AREA
NEW GEORGIA ISLANDS
LIGHT AA POSITIONS
HEAVY AA POSITIONS
SCALE IN THOUSAND FEET

FIG. 9

ment is built around the first. Several of this type were observed in a battery (see figure 5).

(3) Spiral Revetments for MG or Light AA

At Munda a spiral sloped revetment was observed. The inside diameter was approximately 10 feet. The purpose of the spiral was to form a protected entrance. The spiraled wall continued about 3 feet beyond its beginning.

c. Location of Batteries

The location of batteries relative to a landing strip is highly variable. In most instances batteries have been built in natural clearings and elevations. This is illustrated by a comparison of figures 6 to 9.

ANTITANK

3. TACTICS OF RUSSIAN ANTITANK REGIMENTS

The following article from the "Red Star" shows the tactics employed by the Russians in combating enemy tank attacks, as well as the organization of a Russian antitank regiment.

*　　　*　　　*

There is no more powerful or deadly weapon in the struggle against tanks than the antitank gun, which can by its intensive and accurate fire frustrate the attack of great masses of tanks. This weapon is the basic means for the defense of troops, communications, and defensive objectives against tanks.

When the enemy, in organizing his attack concentrates his tanks on separate narrow sectors of the front, and uses them in masses as a battering ram, ruthless defense must be organized, and in the first place, antitank defense. Without powerful fighting units equipped for the purpose this would be difficult to achieve, and one such unit is the destroyer antitank artillery regiment. These regiments can operate independently, in the form of an army reserve, covering points of the front where there is a danger from tanks, or they can operate within the framework of an infantry division, supporting it at such points as may be necessary, and also operating with the supporting tank group.

In a sector where there is danger from enemy tank attack, the regiment can cover with its fire quite a large area, keeping a few batteries in a first echelon and a few in a second. Guns are usually sited so as to be mutually supporting. Each battery forms a separate antitank defense center mutually supporting, and within effective range of, the other batteries.

This makes it possible to increase the field of fire.

a. The Antitank Regiment in Action

The mission of the antitank regiment is to stop at nothing in its battle against tanks, even if it involves the sacrifice of a considerable part of its strength. The regiment will be carrying out its task even if it loses its guns, provided that it destroys and puts out of action a large number of enemy tanks, and provided that against the loss of the guns can be offset the time gained, the holding of territory, or the restoring of a position.

In any circumstances, guns will only open fire on tanks from a distance of 500 to 600 yards, and will do nothing before that to disclose their position. In order to attack the gun position, a tank, allowing for a speed of 12 miles per hour, will require two minutes. During this time, allowing for average conditions of fire, 12 to 14 shots can be fired. Let us suppose that the percentage of effective hits will be 20 to 25. This means that each gun will put out of action two to three tanks, before it is annihilated, assuming that the enemy continues to advance with complete disregard for losses. The whole regiment under such conditions can put out of action several dozen tanks in one attack, and moreover, only the batteries in the first echelon will suffer substantial losses.

Such is the destructive potentialities of the tank-destroying regiment, and they have not in any way been exaggerated. The correctness of these calculations has been borne out by actual combat. In addition there have been not a few cases where one gun has put out of action not two, but six, or eight or even more tanks. A few batteries have thus shattered a German attack.

b. How the Regiment is Organized in Defense

Let us examine the organization for defense within the regiment. The most usually adopted battle formation for the regiment is a diamond shape center of resistance, consisting of nests of resistance each of battery strength, with all-around defense within each battery. In the case of such a formation it is useful to keep one battery in reserve, because the possibility exists that the enemy tanks will go around the flanks of one of the batteries within the first echelon. The speed with which the reserve of fire power can be developed and brought into action is an important factor in success.

Each battery has its main and its alternate positions, for which all data are prepared; dummy positions are prepared if there is time. When a battery has to leave its main position for its alternate position, the former becomes the dummy position. Changing position must only take place during a lull in the fighting, and in all circumstances under cover of darkness. Before the battle positions are taken up, daylight reconnaissance is necessary. During this reconnaissance, the directions from which tank attacks are threatened are noted, battery control points and the tasks of each are fixed, and fire is coordinated. When the batteries take up their positions, the rearward elements of the regiment are moved back sufficiently far for them to be out of range of fire of

enemy tanks and artillery in an attack.

To ensure more effective and flexible control over the regiment, the commander has, in addition to his command post, an observation post in the area of the batteries of the second echelon (in the center of this defensive area, or on its flank). It is very important that it should be possible to observe from the OP the approach of tanks at every point within the regimental area. If this is not possible, the OP is chosen to cover the most vital parts of the defended area.

The regimental commander coordinates the fire of the batteries, ordering them to switch or concentrate their fire as the situation requires. He also determines the time and place for the reserve battery to come into action. If communications with the batteries break down, staff officers are immediately sent out to the batteries to ensure coordination.

c. The Reserve Battery

It is desirable to discuss in greater detail the employment of the reserve battery, since the question is one of importance. This battery can be employed in the following tasks: it can be brought into action at a point where the enemy has made a mass tank attack, in order to stiffen resistance; or on a flank which is open and where enemy tanks would get through to the rear; finally, to prevent further penetration at a point where the enemy tanks have driven a wedge into our lines. In all these cases, the time at which the reserve battery is deployed for action is of decisive importance; this is what determines both its position and the route by which it moves over to the required point.

The reserve battery can either be in the center of the defensive zone (the second echelon) as a whole, or can be split into its platoons and used nearer the flanks. The latter is possibly the better method. For example, if one of the flanks should become exposed, one platoon immediately goes into action, while the second can come up under cover of its fire. In case of a forward move, both platoons can converge simultaneously on the prearranged position.

If a battery (or platoon) is being moved any distance up to about 500 yards, it is best to move the guns by hand, since to bring up the prime movers will take nearly as long. Often, in order to conceal movement of guns, it is better to move them forward several times a short distance by hand, rather than to use the prime movers to move them a considerable distance in a single bound. Moving the reserve battery by prime movers is practicable when the time is available, when the distance to be moved exceeds 600 yards and when the movement is lateral. (A diversion rearwards is desirable in the interests of concealment).

4. A GERMAN ANTITANK MEASURE

A report from a British source states that in the North African campaign, the German tanks and antitank guns, after they had hit and immobilized enemy armored vehicles, continued to fire at them until they were either blown apart or were burning.

ARMORED

5. COOPERATION OF GERMAN INFANTRY AND TANKS

A tank exercise observed in Germany late in 1942 indicated that the Germans were developing a new type of combined tank and infantry tactics. These tactics have now been reported as standard German tactics on the Eastern front. A description of these tactics reported through a British source follows:

Five medium tanks are drawn up in line and immediately behind them two armored troop-carrying vehicles carrying nine men each, armed with automatic weapons. The center tank leads off, followed by the remaining four tanks moving in pairs; bringing up the rear are the two armored troop-carrying vehicles. The moment the leading tanks open fire the men in the troop-carriers dismount and advance at the double in extended order. Then four very large trucks come up, each carrying about 25 riflemen who dismount and advance in three "waves" behind the tanks.

6. JAPANESE LIGHT TANK

a. General

Three basic designs of Japanese tanks have been encountered in Southern Asia and the Southwest Pacific. The "tankette" is a lightly-armored machine-gun carrier of from 3 to 4.5 tons, which has had many models. The light tank, of from 7 to 9 tons, which mounts one 37-mm gun and two machine guns, has also appeared in several variations. The medium "cruiser" tank, mounting a 57-mm gun and either two or three machine guns, weighs from 14 to 16 tons. This latter model may also be encountered fitted with a 47-mm or other caliber gun in place of the 57-mm weapon. A larger tank, of from 25 to 28 tons, is known to exist but has not yet been met with in any theater of operation.

A report from Australia on a Japanese light tank, (see sketch) a variation of Model 2595, captured at Milne Bay draws attention to the following features not included in the "Handbook on Japanese Military Forces" published last September as TM 30-480.

(1) Exceedingly cramped fighting compartment;

(2) High quality of workmanship, material, and excellence of design generally;

(3) Solidly constructed Carden-Loyd type suspension with the weight of the vehicle supported by horizontal compression springs, protected by curved 4-mm (.16 in) armor plate;

(4) Adequate provision of exits for all personnel;

(5) Exceedingly fine workmanship on all transmission components, with extravagant use of self-aligning ball bearings;

(6) All gears are profile-ground, and mating surfaces of gear boxes and housings are hand-scraped for accuracy. Transmission gears are not case-hardened, but are heat-treated;

(7) Ball races are either of German manufacture or else have no name or type number imprinted on them;

(8) Combined rivetted and welded construction of hull, the whole being built around a channel- and angle-iron frame;

(9) Design generally very light, with extensive use of aluminum and light alloys;

(10) Lightly armored, the maximum thickness of armor being .47 inch even for the vertical plate at the rear;

(11) Insulation of the engine compartment against heat from outside sources and to prevent the heat from the engine penetrating to the fighting compartment;

(12) Woven asbestos paddings, separated from the inside surfaces of the tank by an air space, to prevent direct radiation from the hull to the crew in hot climates, and also to guard against injury to the crew when travelling over rough ground;

(13) Numerous vision slits at vital points, but unprotected by glass visor-blocks except directly in front of driver;

(14) Sturdy air-cooled Diesel engine;

(15) High power-weight ratio (approximately 25 HP per ton).

b. <u>Comparison with the German PzKw 2</u>

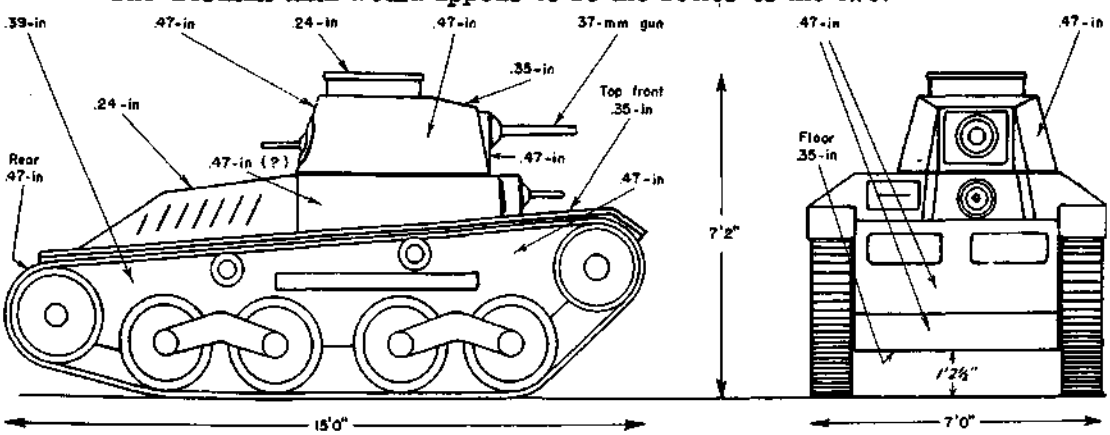
The Jap light tank and the PzKw 2 are of about the same vintage.

They compare as follows:

	Jap Lt Tk	PzKw 2
Dimensions		
Weight (in action)	8-9 tons	9-10 tons
Length	14 ft 4 1/2 in	15 ft 5 in
Width	6 ft 9 in	7 ft 3 in
Height	7 ft 0.5 in	6 ft 6 in
Clearance	15.5 in	13 in
Armor		
Front	.47 in	.79 in
Sides	.47 in to .39 in	.71 in
Rear	.47 in	.71 in
Turret	.47 in	.79 in
Top	.35 to .24 in	.59 in
Armament	1 37 mm 1 MG (in turret, right rear) 1 MG (in hull, forward)	1 20 mm 1 MG (coaxial, in turret)
Engine	6 cyl in line OHV Diesel, 240 HP at 2,000 rpm, air cooled, 5.12 in bore, 7.09 in stroke compr. ratio 15.05:1	Maybach, 6 cyl OHV gasoline, 140* HP, water cooled
Speed	28 mph	25 to 36
Fuel capacity	29 gal	44 gal
Drive	Front	Front

*Rated hp; the engine would probably develop considerably more actual power than the Japanese at about 1,800 rpm.

The German tank would appear to be the better of the two.



JAPANESE LIGHT TANK

c. Additional Details of the Japanese Tank

(1) Armor

The .47 inch armor is face-hardened; the .35 inch, is non-machineable homogeneous plate, only slighly softer than the .24 inch, which is homogeneous hardened. The recoil mechanism of the 37-mm gun is protected by a manganese steel casting, and the machine guns by hardened pressed steel sheaths.

(2) Ammunition Carried

For the 37-mm gun, 130 rounds are carried and for the machine guns, 2,340.

(3) Engine and Drive

On a fighting weight of 9 tons, power-weight ratio is 26.7 HP per ton. Fuel is carried in a main tank of 23 gallons with six in the reserve. The clutch is of the multi-disk type bolted to the fly-wheel, operating through a manual-control gear box with four speeds forward, one reverse. The steering is of the clutch-brake principle, with multi-disk clutches working external contracting type brake drums and operated by steering levers. The suspension is front drive sprocket, rear idler, with 4 bogie wheels in pairs on bell cranks, sprung by compression springs.

(4) Tracks

The tracks are full floating, of manganese steel, 10 inches wide. Ground contact is 7 feet 8 inches, giving a pressure of 9.9 pounds per sq inch.

(5) Intercommunication

The communication system is by radio.

Comment: The light armor and unprotected vision slits would seem to make this tank rather vulnerable, even to rifle and machine-gun fire. Japanese tanks are not manufactured on the assembly-line system; consequently, several variations of the original design will be encountered. Improvised mechanized units have been used by the Japanese in China repeatedly with considerable success. Such units, while probably without elaborated tables of organization and equipment, are organized on the basis of expediency and availability of materiel with the usual reconnaissance, ground-holding, shock, and supply components which characterize the mechanized brigades and divisions of foreign armies.

ARTILLERY

7. OBSERVATIONS ON GERMAN ARTILLERY TACTICS

A recently returned American officer reports that in North Africa the Germans frequently made a practice of firing a few salvoes from a battery; then, moving out, about the time the American forward observers had the position taped. Our own guns would plaster the observed position only to find that the enemy guns, apparently on self-propelled mounts, opened fire from some other point.

An extremely clever trick was reported to have been turned by a German tank unit upon which a British 25-pounder (88 mm) battery was attempting to adjust. After the first salvo hit at some distance from the tanks, a second was fired which apparently fell wide, and the third salvo went wider; the forward observer was frantic.

This is what had happened: the German tanks had timed the first salvo from the report to the instant of burst, which can be done with a low-velocity piece such as the 25-pounder, and fired a salvo from their own guns so that their own shells burst on the ground some distance away from the tanks at the same moment when the battery's shells struck. The forward observer was attempting to correct his own fire from German shell bursts.

The most dangerous German artillery fire was not from HE bursting on impact, but HE time fuze air bursts, and ricochet fire. In this latter type of shelling, the projectiles would strike the ground and ricochet upward, bursting over the heads of the troops.

A rather surprising percentage of the German shells were duds. Whether this was caused by defective fuzes, or for the reason that the projectiles were AP, used when the supply of HE had been exhausted, was not known.

CHEMICAL WARFARE

8. GERMAN WEAPON DECONTAMINANT

The following report is taken from information prepared by the Office of the Chief of Chemical Warfare. This weapon decontaminant called Waffenentgiftungsmittel is a small, semi-opaque, red brown, flat plastic flask 2 1/2 x 2 1/2 x 11/16 inches in size, having a screw top, attached by a cord to prevent loss.

Each German soldier carries one.

It contains about 56 grams of a yellow decontaminating liquid, having a strong odor of chlorine, and shown, by analysis, to contain methyl sulphon mono- or di-chloramide dissolved in tri (B-chloro-ethyl) phosphate. It is applied to all weapon parts with a rag or wadding and wiped off after a brief period. Tests show that it is an effective decontaminant. The solvent is also effective as a powder solvent for weapon barrels.

[redacted]

ENGINEERS

9. BRITISH DEMOLITION AND GAPPING OF GERMAN ANTITANK OBSTACLES

In the early phases of the present war the German successes were in no small part due to their offensive use of tanks and mechanized equipment. As they have gone on the defensive the Germans have paid equal attention to the development of antitank obstacles. The antitank ditch is one of the principal antitank obstacles, to which the Germans have devoted considerable study.

German-designed antitank ditches normally have vertical faces on both sides and not only on the side farthest from the approaching tank. Both faces must be broken down, but the face which the tank must climb up presents the greatest difficulty. The pick and shovel is likely to be the simplest and quickest method of breaking down a vertical face. The shovels should be specially prepared beforehand by bending the heads at right angles to the handle, so that the men can work on a face from inside the trench and pull it down towards them.

It will be necessary to use explosives where the soil is hard or the face is high. Various methods have been tried including the placing of charges against the vertical face or dug into the vertical face. Both of these methods have been unsuccessful as the resulting ramp has proved to be far too steep for the tank to climb. The only method that has been universally successful has been the placing of charges as shown in Fig. 1, though it has the disadvantage of exposing the men while placing the charge. In this method a minimum width of gap of 12 feet is

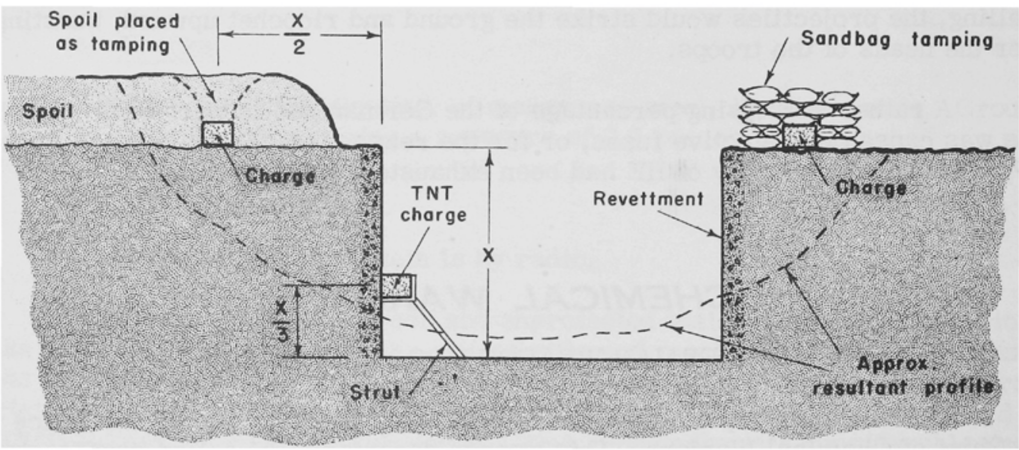


FIG. 1

required. The charge is placed on the original ground level, or dug in flush with the original ground level and tamped if time permits. Boxes containing 25 pounds of TNT, or equivalent explosive, are placed in a line across the gap desired. If the soil is not too compact, the charges can be placed 9 inches apart. If the soil is hard and compact the boxes containing the charges should be touching so as to increase the total charge. An alternative that has proved successful is the placing of double charges at the ends where the tank tracks will cross (see Fig. 2).

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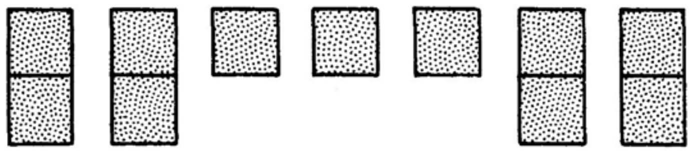


FIG. 2

The distance from the back of the charge to the edge of the trench should equal one-half of the depth of the face. If the trench is revetted with timber, the revettment must be cut. This is done by dropping the necessary cutting charges of TNT against the revettment in the form of an elongated pole charge. The charge will vary according to the type of revettment. It should be placed one-third of the way up the revettment from the bottom of the vertical face. (see Fig. 1).

If the wall is revetted with concrete the sides as well as the bottom of the panel to be blown out will have to be cut with explosives (see Fig. 3). All these

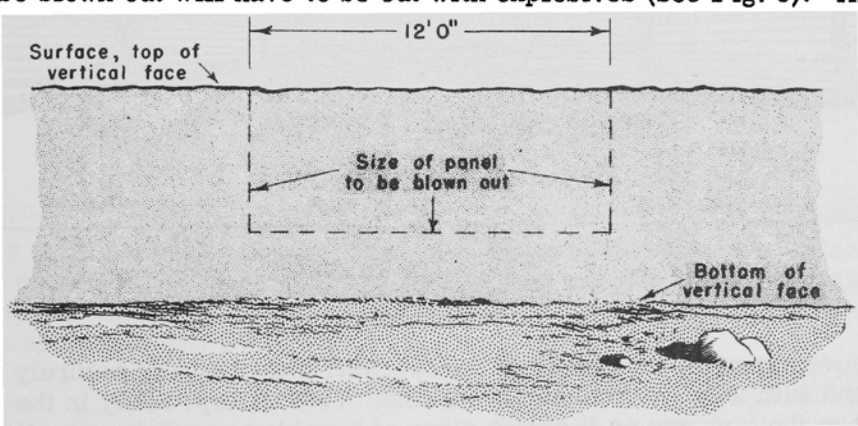


FIG. 3

charges must be made up beforehand on planks. There should be no economy of struts as close contact with the wall or revettment throughout the charge is important. Unless the thickness of the concrete revettment is accurately known, a larger charge than might appear necessary should be used in order to insure destruction. The charges should be laid end to end in order to get complete cutting action.

All charges must be detonated simultaneously including those on top of the trench, on both sides, and the revettment cutting charges. A detonating cap should be used in every 25-pound cratering charge of TNT and at suitable intervals

along the revettment cutting charges. The entire demolition setup is interconnected by means of primacord and leads are brought out to a central junction where detonation can be safely initiated. In order to be on the safe side, all primacord mains should be in duplicate. The junction box should be placed so that the detonating waves go forward along the primacord with no undue bends.

The explosion which breaks down the sides of the ditch leaves loose pulverized earth ramps on each face and loose earth in the bottom of the trench, which must be leveled off with pick and shovel. The spoil forming the ramps is likely to be very loose and soft, so that tanks will dig themselves in when climbing the ramp and get stuck. It is the rear of the tank's tracks which tend to dig in and belly the tank as it opens its throttle to climb out of the trench. To prevent this, brushwood fascines must be made ready to provide a good surface on the bottom of the ditch and resist the digging in by the rear end of the tank.

The fascines are laid crosswise and must be carefully made or they will tend to provide a track that will be too steeply cambered and the tank will slip off sideways. To prevent such sliding the fascines must be made wider at the ends, than in the middle by placing the brushwood, of which the fascines are made, with the thick ends outwards and the thinner parts towards the center (see Fig.

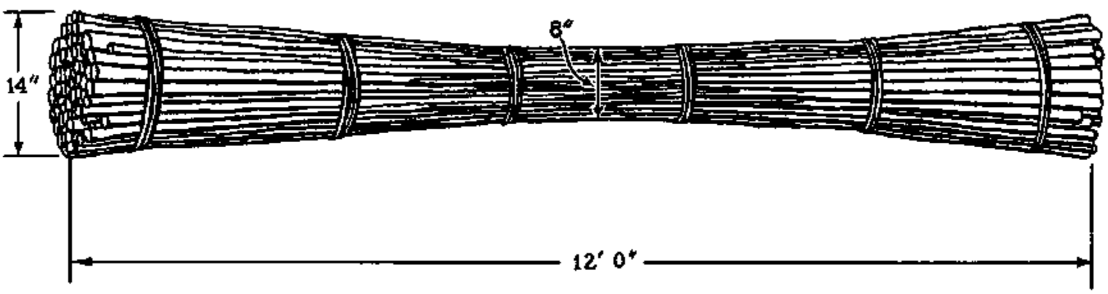


FIG. 4

4). To insure strength, the center of the fascines must be very securely and tightly bound with wire. A reserve of fascines must be kept ready in the ditch to strengthen the tank gap as it shows signs of breaking up. It is essential that there be continuous maintenance of the gap while it is in use.

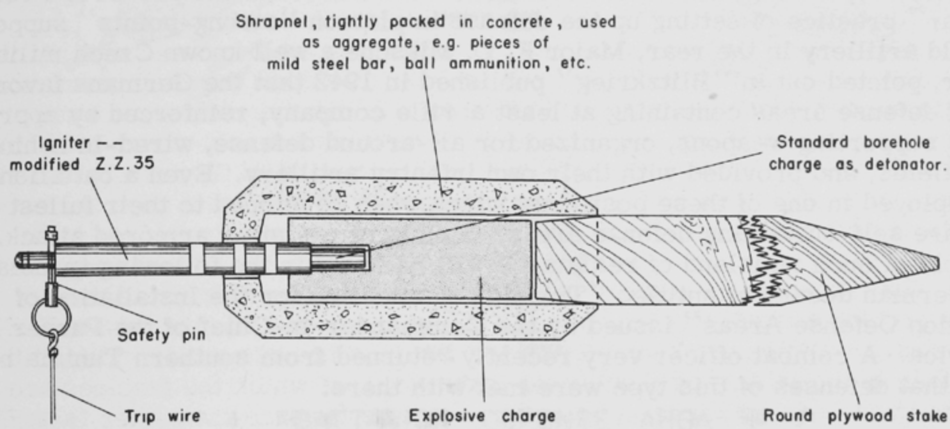
10. GERMAN IMPROVISED ANTIPERSONNEL MINE

A German improvised concrete antipersonnel mine is shown in the accompanying sketch.

It is used with a trip mechanism. One type of igniter which has been found with this mine is a modified type of the German pull-release igniter (Z and ZZ35)

[redacted] [redacted]

having no hole in the top of the firing pin for attaching a trip wire. Instead the trip wire is attached to the release pin; when the release pin is pulled out by the trip wire, the firing pin is released and detonation takes place. The igniters (on which is stamped <u>Nur Zugzunder</u> - pull only) are packed in a standard ZZ 35 box



IMPROVISED

GERMAN CONCRETE ANTIPERSONNEL MINE

but with a label pasted on describing them as percussion igniters. The firing of the mine causes a belt of shrapnel (pieces approximately 3/8 x 1/4 inch) to be thrown out all around the mine. The concrete is reduced to dust. The effective radius is approximately 30 yards.

INFANTRY

11. CONSTRUCTION OF A GERMAN BATTALION DEFENSE AREA IN NORTH AFRICA

As stated in Tactical and Technical Trends, No. 27, p. 21, the German doctrine as applied to defense calls for the concentration of the available forces in a few, very strong islands of resistance. In contrast to the pre-1940 French "linear" practice of setting up the defense in platoon "strong-points" supported by field artillery in the rear, Major F. O. Miksche a well known Czech military writer, pointed out in "Blitzkrieg" published in 1942 that the Germans favor the use of defense areas containing at least a rifle company, reinforced by appropriate supporting weapons, organized for all-around defense, wired-in behind mine fields, and provided with their own infantry artillery. Even a battalion may be employed in one of these positions, which,when developed to their fullest extent, are self-sustaining defense areas, capable of resisting armored attack. An example of such an island of resistance will be found in the following translation of a German document entitled "Training Publication for the Installation of Battalion Defense Areas" issued by the Commander-in-Chief of the Panzer Army in Africa. A combat officer very recently returned from southern Tunisia reports that defenses of this type were met with there.

*　　　*　　　*

In order to strengthen the power of defense, the troops will organize defense areas which they can hold against attacks coming from any direction.

a. Dimensions

The normal battalion front in a defensive position may be from 3,500 to 4,000 yards; company defense areas (see figure 1) are some 700 yards wide by 300 in depth, and spaced about 500 yards apart.

b. Garrison of Company Positions

A battalion sector is divided into several company defense areas. In general, a rifle company with infantry heavy weapons attached occupies each of the four sub-defense areas. The unit command posts are also to be installed within these defense areas. Artillery is stationed behind the forward company defense areas on terrain protected by the rear company defense area of the battalion sector.

[Note: Whether this artillery is composed of the infantry guns, or attached field artillery is not clear but field artillery was found in such defense areas in Tunisia. Obviously, while the lay-out is such that infantry guns could cover the forward company positions, some field guns of greater range could be used, if available.]

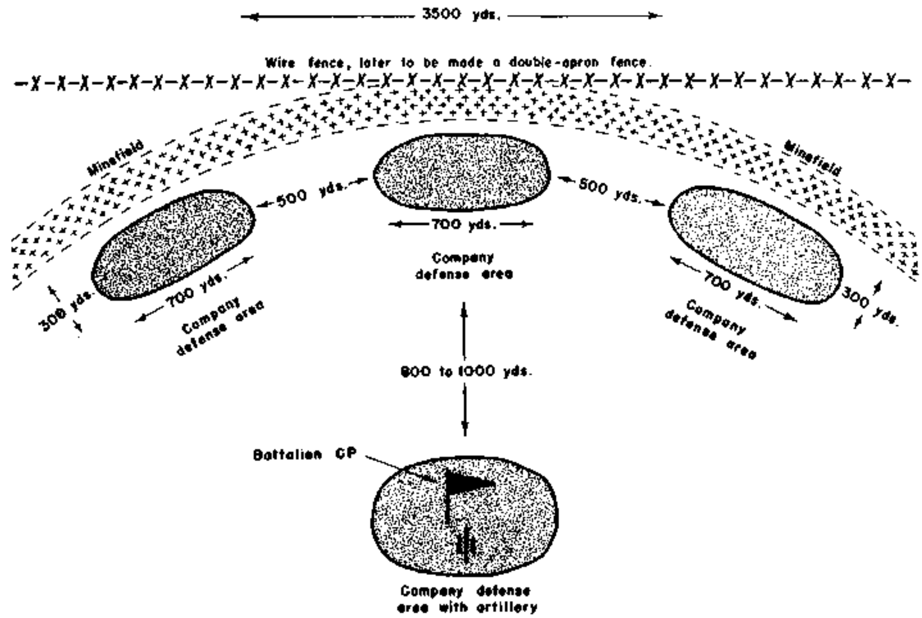


FIG. 1
BATTALION DEFENSE AREA

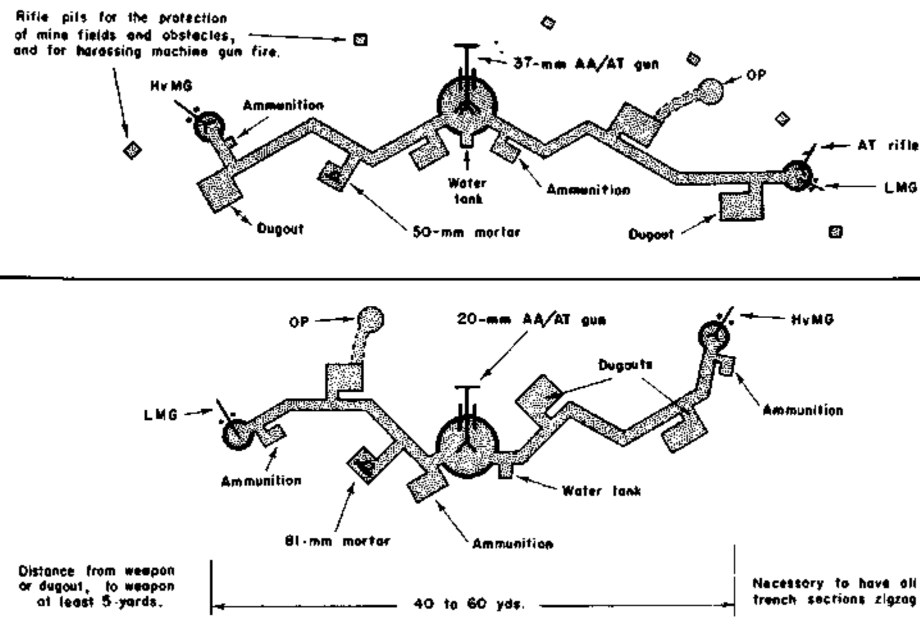


FIG. 2
TWO LAY-OUTS FOR A SQUAD POSITION, REINFORCED

c. Weapons

Weapons are distributed so as to give mutual supporting fire. Every company defense area is provided with infantry light and heavy weapons. Armor-piercing weapons, and antiaircraft guns are attached.

d. Defenses

The company defense area is to be fenced in with wire. However, platoon areas within such company areas are not to be inclosed by wire. [Note: Perhaps sufficient wire for both inside and outside entanglements was not available as wired-in platoon areas have been encountered.] The distance of the wire entanglements from the most forward weapons is about 50 to 100 yards.

To facilitate reconnaissance activity, narrow lanes through the wire entanglements are to be laid out on the enemy side. Wide lanes are permitted only on the flanks.

To defend the protective minefields, and wire entanglements,rifle pits, listening posts, observation posts, and weapon emplacements are installed. Dugouts are constructed for the garrison of the area.

Communication trenches are to be dug only between the firing positions or observation posts and nearby dugouts. Extensive communication trenches give the attacking enemy a chance to gain a foothold inside. In stony terrain the parapet is to be made of sandbags or stone, but trenches must first be dug deep enough into the ground (by blasting, if necessary) to prevent the position from showing above the surface.

As a matter of principle, no installations, as seen from the enemy side, must stand out above the surface of the grounds. Defended areas are not to be laid out on the crests of ridges but on the slopes [whether forward or reverse slopes, is not made clear]. Although the highest positions are normally the most desirable for observation and antiaircraft purposes, such installations must not be placed on forward slopes in view of the enemy, but somewhat further to the rear, masked by the crest.

Dummy positions (also for artillery and antiaircraft) are to be used for the purpose of diverting enemy artillery fire. Distance from the other positions must be great enough to protect the latter from the natural dispersion of artillery fire.

The sections of trenches inside a position must have frequent traverses or angles to reduce the splintering effect (see figure 2). Good camouflage is the best protection against enemy fire.

e. Transport

In rolling country, vehicles must be completely hidden from the view of the

enemy. In level country, this result is obtained by keeping the vehicles well to the rear of the combat positions, and by using camouflage with nets. These nets can be improvised with open mesh wire covered with any sort of brush or camel thorn.

* * *

Comment: Figure 1 indicates in diagramatic form the lay-out for a battalion defense area on more or less level ground. In actual practice, of course, natural defense positions would be entrenched. The front-line wire, naturally, would scarcely be laid out in a straight line. Both diagrams are based on German sketches, and are notable for their simplicity.

The three forward company defense areas are composed of several platoon strong-points subdivided into squad positions like the ones illustrated in figure 2. The large number of heavy and automatic weapons is worth noting. A squad area provided with an AA/AT gun, a mortar, a Hv MG, a LMG all well dug in and mutually supporting, flanked by similar squad areas and reinforced with the fire of infantry cannon from the support position, make a defensive position of great power, entirely aside from the garrison's rifle and grenade fire. Such a defense area could, if necessary, be supplied from the air if ground communications were cut off.

By necessity, the plan here outlined bears a superficial similarity to defensive layouts found in our own field manuals, but it should be noted that the method prescribed in the above document is based on the German theory of defense against the principal effort in a German armored attack. Such an attack combines overwhelming local superiority in men and equipment, the onset of tanks with motorized infantry and artillery following, combined with a fire from massed artillery, mortar and heavy weapons of the utmost possible violence, supported by dive-bombing. All is concentrated on a narrow front of perhaps 1,500 yards. The theory of defense assumes that the islands of resistance must allow the tanks to pass through since they can not prevent it, but do endeavor to stop by fire especially from the flank, the motorized infantry and artillery which follow behind. Cut off from their supporting infantry, the tanks are expected to be stopped by the rear elements of the defense and destroyed. A counterattack launched by the rear elements follows to eject any remaining enemy forces that retain a foothold in the defense system.

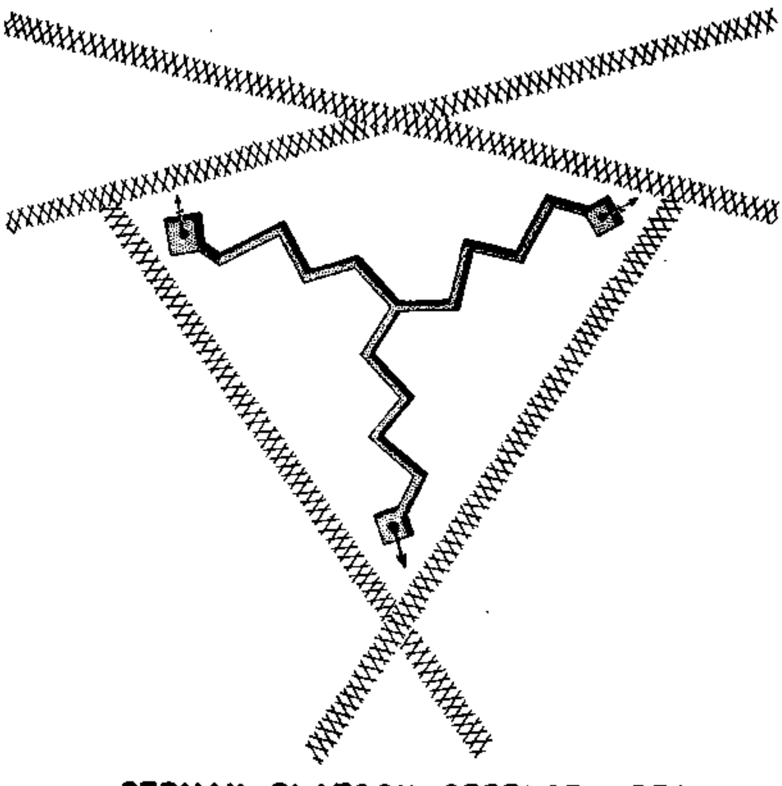
The extraordinarily wide frontage, 3,500 yards, is remarkable, as well as the wide spaces between the company defense areas - 500 yards. One commentator suggested that this defense would be far easier to pierce than our own more closely-knit system, but it must be remembered that the German plan here outlined is based on no theoretical study but upon the hardest possible school of African battle.

[redacted]

Another interesting feature is the concentration of heavy weapons entirely within the company defense areas.

A third feature is in the extensive use of minefields. Whether these minefields are laid by the garrison or by engineers is not made clear in the instructions, but as each German infantry company contains a group of men trained to lay and lift mines, it seems reasonable to suppose that the minefield in front of the battalion area was to be laid by the garrison. The absence of any indication of mines between the company defense areas is rather odd. It would seem logical to mine these avenues rather heavily. The failure to indicate such mining should, however, not necessarily preclude the possibility that mines might be found there. The system here illustrated would appear vulnerable to infantry attack. This, in fact, was the method used by Montgomery at Alamein, where, reversing the German practice, infantry and engineers equipped with mine detectors led the assault, behind a devastating artillery barrage. It is understood, however, that the British had a substantial superiority in both guns and tanks.

In southern Tunisia was found a rather unusual lay-out for a German platoon on the defensive. American officers report that inside the wired-in company



GERMAN PLATOON DEFENSE AREA

defense areas, were wired-in platoon defense areas, laid out in a more or less Y shape. The accompanying sketch is schematic, and not to any scale, but illustrates

the plan of such a position.

One branch of the Y, or the broad angle might be pointed forward, or occasionally, one branch ran over a crest with the other two limbs on the reverse slope. Automatic weapons were placed at the ends of the trenches; the trenches themselves were sometimes blasted out of the rock. Mutually supporting cross-fire, of course, was provided throughout the company area.

12. JAPANESE CONDUCT OF THE DEFENSE

When forced on the defensive the Japanese have striven to attain the element of surprise by means of silence and concealment; employed deceptive measures wherever possible; made extensive use of snipers; and attempted to disrupt the enemy advance by infiltration tactics. The following data on Japanese defensive tactics is taken from a recent British publication.

* * *

Unless attacked, Japanese troops occupying forward positions very seldom open fire, for fear of disclosing their location, even if the target offered is a good one. From the Japanese point of view, the defensive battle begins only when the assaulting troops are too close to be missed by their light and heavy machine guns. Carefully-concealed machine-gun positions then come to life when the assaulting troops are too close to the objective to receive support from their own artillery. If the assault is up hill the Japanese add showers of grenades.

Following normal practice the Japanese make the machine gun the principal weapon of defense. Automatic weapons are sited to fire along prepared lines, lanes being cut in the jungle if necessary. Heavy machine guns are sited well forward and are generally sub-allotted to platoon areas; they are often to be found on high ground or dug into the banks of "tanks," (water reservoirs); they are also sited to cover the main lines of approach; they are often placed singly, and frequently alternative positions are provided. An important point to remember is that during the defensive battle heavy machine guns sometimes fire along a line not more than ten yards from the forward edge of the Japanese main line of resistance, and assaulting troops, if unprotected by smoke or darkness, may therefore suffer heavy casualties just in front of the enemy position, particularly if they have become bunched in converging on the objective. Mortars and grenade dischargers come next in importance to the machine gun. Mortars of 3-inch or larger caliber may be allotted to rifle companies at the scale of one per company, but the weapon most frequently used by forward units is the 2-inch grenade discharger of which there are three in each platoon. This weapon throws a heavy grenade 700 yards. Once an attack is launched mortar and grenade discharger shelling is frequently

directed on areas which cannot be reached by flat trajectory weapons. Particular attention is paid to probable lines of approach and likely assembly areas.

Although the extent to which snipers are employed varies greatly with each front, there are certain places where snipers may be expected; namely, above small advanced positions, on the flanks of defense areas, covering lines of approach to Japanese positions, and covering paths in our own [British] area. Patrols, varying in strength, are very active at night and attempt to infiltrate between positions held by our troops - particularly those new to a sector.

The Japanese, so far, have made little use of artillery in defense. They tunnel into hill sides and build dugouts which afford adequate protection against all but a direct hit from a field gun. Well-built enemy earthworks often render his destruction by the normal supporting weapons impossible. Supporting fire shakes him and makes him keep his head down, but if the assault does not go in with all possible speed after the supporting fire has lifted, he is quick to seize the momentary advantage which slow troops may give him.

The Japanese launch immediate counterattacks against troops who have captured part of a position. These small local counterattacks may be made by only a dozen men led by an officer; they are preceded by a shower of grenades from grenade dischargers and the charge is made with automatic weapons. This immediate counterattack may be launched five to ten minutes after the position has been penetrated. A wild war cry, to which is sometimes added the shout "Charge!" in English, gives warning of what is impending.

Two examples of the Japanese conduct of the defense, are illustrative of most of the tactics commonly employed.

a. Example 1

In one case the Japanese placed a forward defense area on the hill illustrated in the accompanying sketch. All earthworks were carefully camouflaged and had it not been for sentries in our own forward positions, about 50 yards down the left slope of the hill, hearing the Japanese talk at night, it would not have been possible to say definitely that they were there.

Our reconnaissance parties, exposing themselves boldly on a ridge facing this position and 400 yards from it, were never fired upon, and many rounds of 3-inch mortar bombs were fired into it without producing any reaction.

The general line A-B was nearest to the point of observation. The position, however, continued on the right of A following the high ground which curved back slightly. It also receded behind B following the highest contour.

The position around A-B was probably held by a platoon as part of a company holding the main hill of which this feature was only a part.

The information available to the attacking troops, was that there were some enemy on the hill who had never been seen. They had been heard to talk at night and were believed to consist, at the very outside, of one platoon.

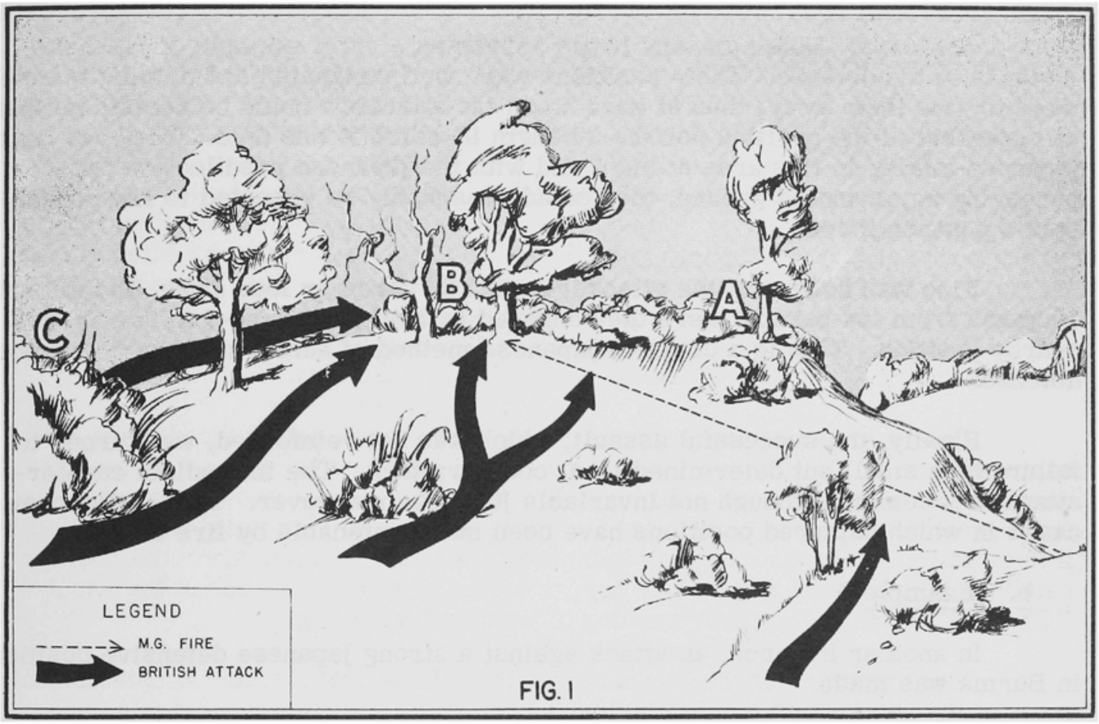


FIG. 1

After an intensive mortar bombardment one company launched an attack up both sides of the spur from C. The black arrows indicate approximately the line of advance of the main assaulting parties.

The leading assaulting troops made good progress until they were about 30 yards from the general line A-B; then a veritable hurricane of fire was let loose upon them. They were engaged by light machine-gun and grenade-discharger fire and began for the first time to suffer appreciable casualties. Shouting their war cries they continued to climb the hill, making use of such meager cover as the small bushes and folds in the ground offered. As the action grew in intensity camouflage began to slip off the parapet of what could now be identified as a continuous trench, part of which ran along the front A-B. When the leading troops were about ten yards from the parapet, they were subjected to accurate Japanese heavy machine-gun fire from a gun sited in another position. Although greatly weakened by casualties, they, the [British] continued to advance and, led by their company commander, hurled grenade after grenade into the Japanese position. They finally stormed and occupied the trench, killing or driving out all Japanese in that sector.

About ten minutes later there was a wild howl, as of jackals and hyenas; a shower of grenades from grenade dischargers fell among our troops, and with shouts of "Charge!" the Japanese counterattacked with automatic weapons, forcing our troops off the hill.

Comment: This company battle serves as a vivid example of Japanese methods in the defense. Their positions were well concealed and nothing tempted them to give them away; thus at zero hour, the attackers could be certain neither of the extent of the position nor the strength in which it was held. They had heard Japanese talking in this area at night and with the Japanese predilection for occupying commanding ground, they could reasonably be expected to have organized a position there.

Fire was held until the attackers were 30 yards or less away, and not until 10 yards from the parapet were they engaged by heavy machine-gun fire from a nearby position. This is a common Japanese method of achieving surprise in the defense.

Finally, the successful assault, which was not reinforced, was turned to failure by a small but determined local counterattack. The immediate counterattack is a common, though not invariable Japanese maneuver. There have been cases in which captured positions have been made untenable by fire alone.

b. Example 2

In another instance, an attack against a strong Japanese defensive position in Burma was made.

(1) Plan of British Attack

The plan of attack was divided into four phases:

Phase 1--At 0545 A Battalion to capture the eastern half of the Chaung River as far west as M16 (see accompanying sketch).

Phase 2--At 0645 B Battalion to capture the jungle area as far as line marked "A."

Phase 3--At 0710 C Battalion to extend their position on Twin Knobs to as far south as the line marked "B."

Phase 4--At 0850 B Battalion to exploit to line marked "C."

Artillery and heavy machine guns supported the attack with a barrage and concentrations.

(2) Japanese Position

The Chaung itself is a strong, natural obstacle, which the Japanese made

into an excellent defensive position, by building an intricate system of communicating weapon pits and defense areas, and at least one pillbox at S 5 (see accompanying sketch). All positions were mutually supporting.

The pillbox or bunker, which consisted of an outer covered weapon pit, and an inner chamber which is reported to have included both metal and concrete materials, was sufficiently well built to withstand no less than three direct hits from a 3.7-inch howitzer at point-blank range. It follows, therefore, that assaulting troops on and around the pillbox could be subjected to heavy mortar fire without any detrimental effects to the occupants.

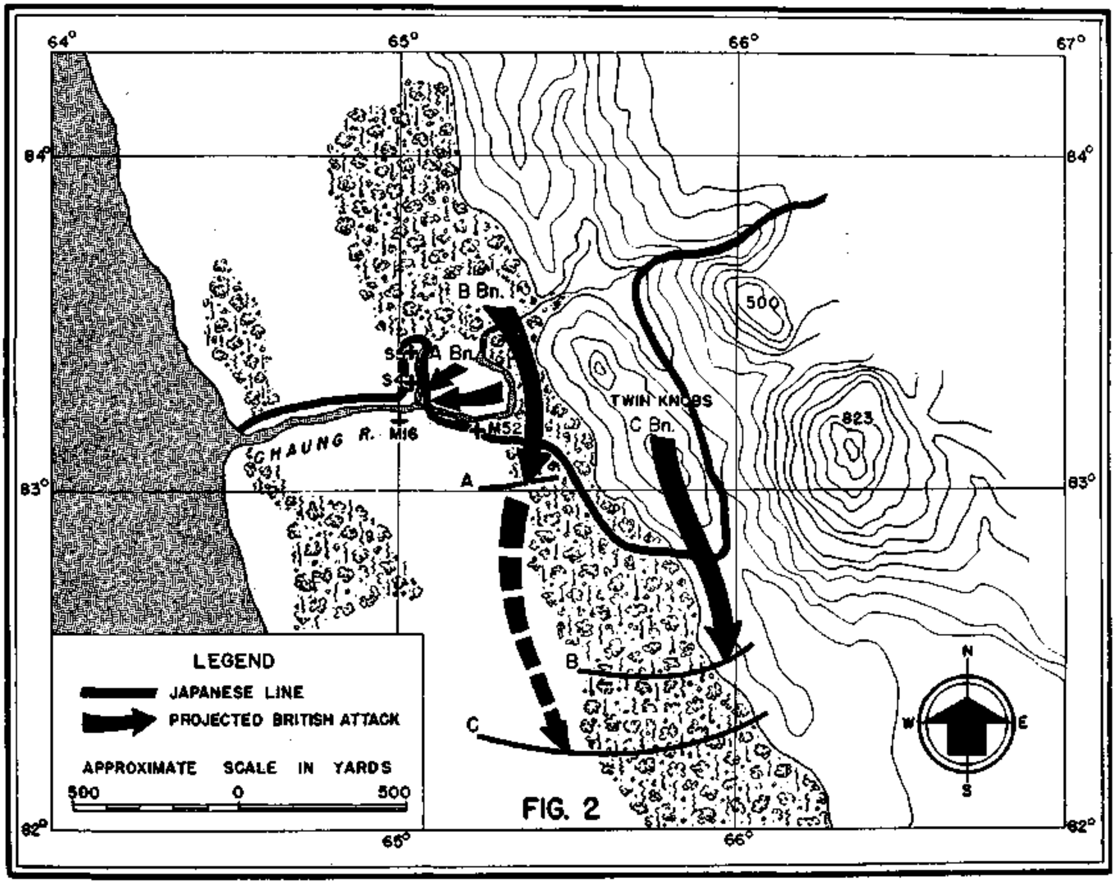


FIG. 2

All other works were dug well down and presumably provided with dugouts, for although approximately 124 tons of shell were fired into the Chaung area immediately prior to the attack, there was no indication that the enemy's fire power had been impaired.

The Chaung is overlooked from the east by two commanding positions, Hills 823 and 500. These are both steep and densely wooded. Although no weapons were

pin-pointed on these hills, mortars, heavy machine guns and at least two 75-mm mountain guns undoubtedly fired from there. These weapons could thus put down defensive fire anywhere in the area, by day, by night, or through smoke.

Unlike other Japanese defensive positions, weapon pits and fox holes near the Chaung were clearly visible from the air and in many cases could be seen from OP's. This does not mean that any movement, or guns were visible, but it was possible to determine where earthworks had been dug. However, in the jungle and on the hills 823 and 500 positions were so well concealed that with the exception of the two strong points which held up B and C Battalions, they remained undiscovered to the end of the battle.

(3) Course of the Battle

A Battalion commenced their advance without appreciable opposition, but soon the company attacking the Chaung from the north experienced the now familiar Japanese tactics of withholding their fire until the last moment, and it was not until they were crossing low, loose strands of wire, about 15 yards from bunkers at S 4 and S 5 (see sketch) that intense fire was brought to bear on them. These two bunkers were attacked repeatedly, but without success; our troops could find no opening through which to throw grenades and while on and about these bunkers they were subjected to mortar fire to which the bunkers themselves were immune. The other two companies were more fortunate, and although they were subjected to showers of grenades from grenade dischargers and hand grenades while advancing down the Chaung, succeeded in taking their objective, which included M 16. A proportion of these troops advanced up the small Chaung and cleared it as far as S 4 where they in their turn were held up. As the light improved, and as presumably the Japanese realized the situation, showers of projectiles from all weapons were fired into and around the Chaung, and heavy machine guns opened up from the flanks.

Meanwhile Phase 2 began and B Battalion advanced only to be held up by what was described as a defense area similar to S 5 (M 52 on the sketch). B Battalion was unable to reduce this position and was subsequently withdrawn.

Phase 3 commenced according to plan, but C Battalion almost immediately suffered the same experience as B Battalion, in that they ran into a cunningly concealed heavy machine gun position just beyond the line of departure. This position was so well hidden, that it escaped notice when the area was reconnoitered prior to the attack. This position also held out.

Comment: The attack failed through no lack of courage; the dash and daring of the attackers has been aptly described as an epic of collective gallantry. Why then did the defense succeed? There are important reasons:

Following his normal practice the Japanese held his fire until the assaulting troops were almost upon him; only then did his machine gun nests come to life--machine gun nests about whose strength or existence we knew little or nothing. To quote from a British defense pamphlet "the main task of medium [U.S. heavy]

machine guns. . .will be to take toll of enemy unarmored troops. . ." and no heavy machine gun is better sited to fulfill this role than one in an undetected nest with a big enough covering of earth, timber, and perhaps steel and concrete, to withstand the preliminary bombardment. In fact, by continually improving their positions and by careful attention to camouflage, the enemy had achieved surprise in the defense.

Strong positions which could withstand the fire of our artillery could also withstand the fire of Japanese mortars which gave additional protection to their garrisons.

The first and chief problem then, which the Japanese defensive position presents, is the problem which has faced every modern army for more than 25 years--it is the detection and neutralization of the machine gun firing from a well-built nest.

It will be noticed that no counterattack was launched in this battle, elements which had penetrated the position being dealt with by intensive mortar and grenade-discharger fire alone. This practice of bringing down defensive fire on one's own positions is likely to be a common feature of Japanese defensive tactics. In fact either by immediate fire or immediate counterattack the Japanese will attempt to make an overrun position untenable.

* * *

American Observers' Notes

Officers just back from the New Guinea and Munda fronts describe a Japanese defense system containing rather unusual features.

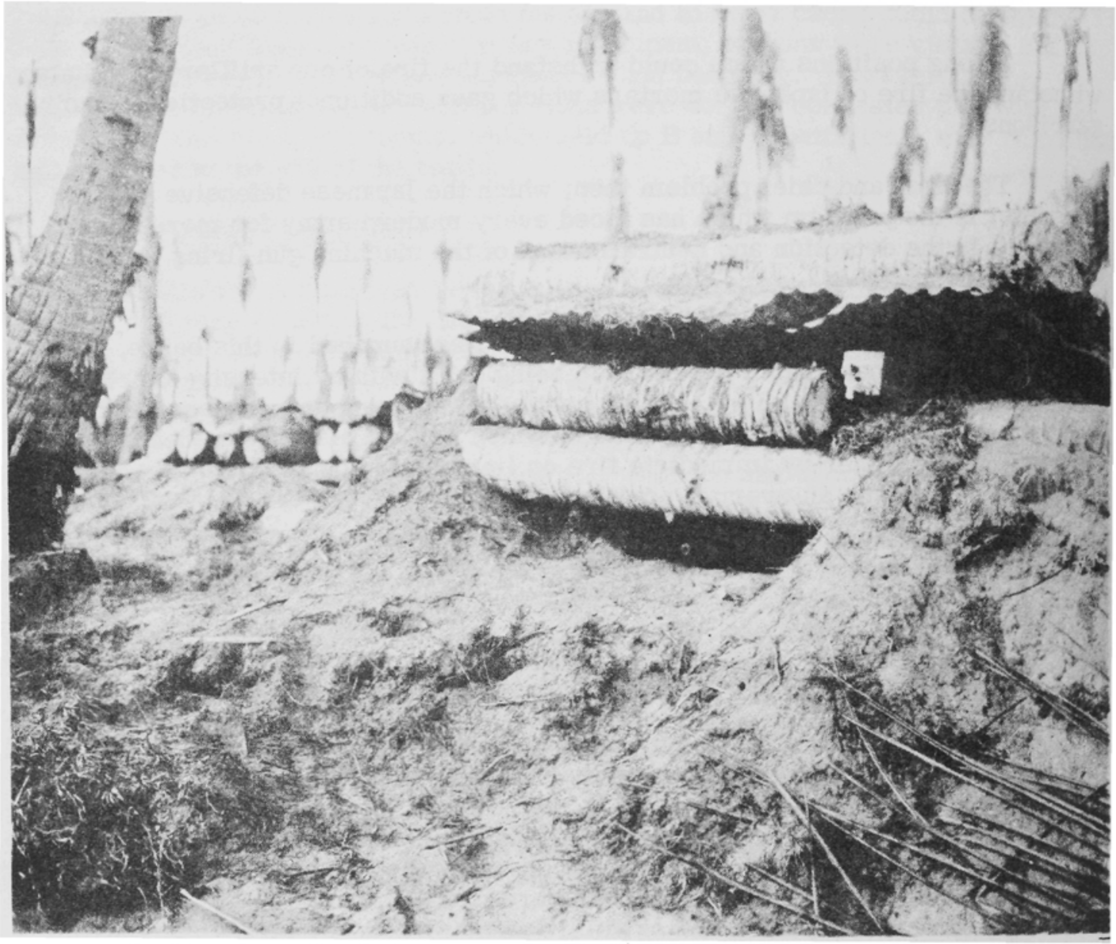
The area to be covered is fortified with bunkers set as closely as five yards apart with a second line of bunkers covering the gaps and a third line behind the second. The bunkers themselves are made of three layers of springy palm logs covered with earth and skillfully camouflaged. So strong are they that one officer reported he had seen British 25-pounder shells and our own 81-mm-mortar projectiles "bounce off them." A 105-mm howitzer shell, however, would penetrate (see accompanying photographs for typical bunkers.)

Behind the lines of bunkers the Japanese sited mortars.

The armament of individual bunkers was apt to be an automatic weapon, which the Japs operated until killed.

Instead of fire-lanes, passages about 2 feet square were cut through the brush or grass, down which the Japanese would fire. Such rabbit-runs were practically impossible to detect until the garrison of the bunker opened fire.

Frequently, bunkers would be protected on each side by rifle pits, connected to the bunker by a shallow crawl trench. Access to the bunker was by holes so small an average American could not wiggle through. "The Japs," stated the observer, "burrowed like gophers."



Another favorite defense was to dig in among the roots of a banyan tree--a large tree that stands up above the ground on a mass of stilt-like legs.

Canister fired by a 37-mm gun proved effective against such a defense. Its balls tore through the jungle growth for 150 yards, delivering a cone of fire about 30 yards wide at 100 yards range, sufficient to hit both the bunkers and its protecting riflemen with the same charge.

The bunkers shown in the accompanying photographs, were part of a Japanese defensive position in New Guinea. It is reported that they were thoroughly "worked over" with artillery before their capture, which may account for the lack of camouflage. The timber in this case is probably cocoanut logs. Else-

where a type of palmetto is used. Both woods are springy and therefore tend to absorb the shock on contact of a shell. In the first photograph note how close the bunker in the background is to the one in the foreground. It was this type of Japanese field fortification that has caused U.S. troops such difficulty in the Munda area.

MEDICAL

13. IMMERSION FOOT

General

"Immersion foot" is an ailment, normally rare, which results from having the feet wet, as in a lifeboat, for days on end. It is aggravated by cold, and since the freezing point of sea-water is lower than that of human blood, the feet and lower legs of persons in lifeboats and on life rafts are apt to exhibit symptoms of freezing if kept wet for hours and days with ice cold sea water.

Torpedo victims are often huddled together with little chance for movement; immersion foot is the result. Technical experiment has also demonstrated that vitamin deficiency plays a great part in lowering the patients' resistance. It was discovered that immersion foot could occur in warm southern waters as well as in the North Atlantic.

With no or improper first-aid or medical treatment, amputation is frequently necessary, and intense suffering almost inevitable. However, with proper precautions, first-aid and correct hospital treatment, much of this pain and injury can be avoided. Three medical officers of the Canadian Royal Navy, Surgeon Commander D. R. Webster, Surgeon Lt. F. M. Woolhouse and Surgeon Lt. J. L. Johnston have developed such methods, described in the April 1943 issue of the Royal Canadian Navy Monthly Review, from which this article is extracted.

Symptoms

Victims of immersion foot report that they felt no pain after the first cold in their feet and legs. However, as their feet grew colder, and the circulation slowed down, the tissues were damaged, and as time went on, the skin became waxy-white in color, and insensitive to pain or temperature. Their extremities were practically dead with no more than a spark of life to be nurtured back to health through a gradual rise in temperature. Under such conditions, infection develops easily in the injured tissues and gangrene would be an almost certain result.

Dangers of Improper First Aid

Sympathetic rescuers have massaged these pitifully swollen feet and covered them with blankets and hot water bottles. Soon began, "intense, intermittent, stabbing, shooting pains, which started in the ankle joint and radiated to the tips of the toes with a generalized tingling sensation." Some victims of such misdirected treatment developed gangrene, which sometimes resulted in amputation. This happened to the survivors of one internationally known ship which was sunk in European waters. Of those picked up by trawlers, almost all had to have their feet amputated.

Precautions

It is most important to keep the feet dry and warm and to exercise the legs and feet--two things next to impossible in a crowded life boat or a raft. The first thing to be done, if possible, is to cover the legs and feet with a thick coating of grease as do long distance swimmers. Constricting clothing and shoes must be removed--they are useless in keeping the feet warm in the water anyway.

Correct First Aid

The first-aid rules are simple. The patient is to be kept dry and warm except for his feet. Any wounds, cuts or sores are to be dusted lightly with sulphanilimide powder. The legs are wrapped in some clean, soft material and laid on pillows.

Treatment

Doctors Webster, Woolhouse and Johnston used as their basic theory, "treat cold with cold." The affected areas were slowly brought back to normal temperature over a period of weeks. At first when it became necessary to devise a treatment in line with this theory, the patient's legs were placed, elevated, covered with a sterile towel, and packed with ice bags. Later, instead of ice, a cold blast from a fan was used, and at another time, the patient's feet were left exposed in a cold room while his body was warmly covered. Finally, a refrigerator was developed, with two openings for the legs, like a prisoner's stocks.

So effective was this treatment in relieving pain in one case when the cooling system failed, a patient fled to a window and promptly put his feet out to cool in the winter air.

There are some "must nots" which are most important:

No rubbing or massage;
No heat of any kind near the affected parts;
The patient must not stand or walk and his legs and feet must be gently handled;
The legs and feet must not be washed or soaked;
No lotions or antiseptics except sulphanilimide may be applied.

Results

At an eastern Canadian port, of 150 cases so treated, only seven amputations were necessary.

Men who were cured had to learn to walk all over again, and had an unusual and awkward gait until they regained the use of their limbs. Severe cold, too, would bring aches and pains to their feet.

ORDNANCE

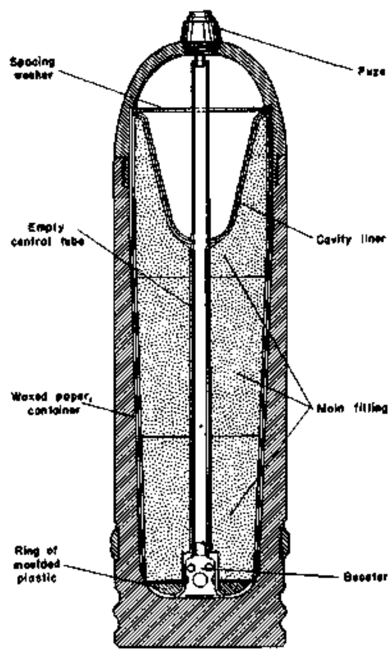
14. GERMAN 105-MM HOLLOW-CHARGE SHELL

The use of hollow-charge ammunition by the Axis armies was referred to in Tactical and Technical Trends, No. 18, p. 27.

The following description and accompanying sketch will serve to bring out some details covering the German 105-mm (4.13 in) hollow-charge shell called the 10-cm Gr 39. This ammunition is used in the German 105-mm gun howitzer.

[redacted]

a. General



GERMAN 105-MM HOLLOW CHARGE SHELL

Weight, filled, unfuzed	25 lb 7 1/8 oz
Weight, filled, fuzed	25 lb 9 oz
Weight, bursting charge	3 lb 14 5/8 oz
Penetration (estimated)	
Homogeneous armor	3.15 in at 30°
Homogeneous armor	3.74 in at normal
Color	Olive green, red band above rotating band.

An interesting point in the design of this shell is the shape of the cavity in the nose, which differs from that of the 75-mm hollow-charge shell (see *Tactical and Technical Trends*, No. 19, p. 27). In the latter case the cavity is cylindrical for the greater part of its length, being rounded off at the rear. In this case the cavity is conical except at the extreme rear, which, too, is rounded.

b. Method of Filling

The charge is supported on a ring of moulded plastic material fitting the base of the shell cavity. The charge, together with the plastic ring, central tube and cavity liner fits into a waxed paper container. It is probable that the charge is loaded into a hot shell lined with a bituminous composition to keep the filling firm.

c. Bursting Charge

The bursting charge consists of three pellets of cyclotol (TNT) wax, hot pressed, details of which are:

			Composition		
	Weight	Density	Cyclotol	TNT	Montan Wax
Nose	561 gm (19 oz 12.5 dr)	1.56	57.7%	39.6%	2.7%
Middle	720 gm (25 oz 6.25 dr)	1.58	57.1%	39.8%	3.1%
Base	490 gm (17 oz 4.5 dr)	1.58	55.5%	41.7%	2.8%

Note: It is probable that fuze AZ 38 and booster Zdlg 40 are fitted. These are shown in the accompanying sketch.

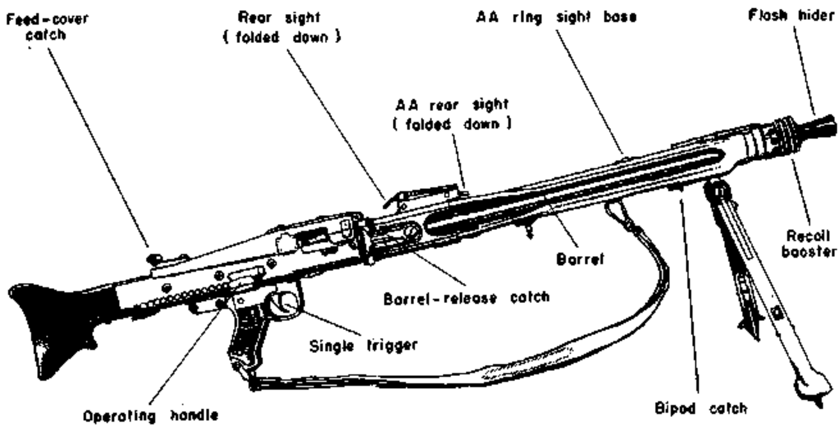
[redacted] [redacted]

15. GUDOL POWDERS

Frequently within recent months technical descriptions of German ordnance contained the word "Gudol" or "Gudol-type powder". A description of this flashless propellant has recently become available. Its chief constituents are triglycoldinitrate, nitro-cellulose and nitroguanidine in equal parts. Nitroguanidine made by nitrating guanidine, which is a urea compound made from calcium cyanamide, releases large quantities of ammonia when discharged as a propellant. While the ammonia lowers the gas temperature below the flash-point, when used in large quantities as artillery ammunition, it produces enough ammonia gas to unfavorably affect the gun crews, particularly on a still day.

16. MORE DETAILS OF THE GERMAN MG 42

While an account of the new model 42 dual-purpose machine gun was published in Tactical and Technical Trends, No. 20, p. 28, further details of this light and fast-shooting weapon are now available. The locking mechanism is novel to those familiar with machine guns other than the Russian Degtyarev. The present standard dual purpose machine gun of the German Army is the MG 34; the latest known type of German machine gun to have been captured is the MG 42. It seems evident that this weapon is designed to replace the MG 34 although the actual extent of replacement is not known. (For additional details on these weapons see "German Infantry Weapons", Military Intelligence Service, Special Series No. 14 dated May 25, 1943.)



German M.G. 42

Weight with bipod	23 3/4 lbs
Length overall	48 in
Length of barrel	21 3/4 in
Weight of barrel	3 lb 14 1/4 oz
Cyclic rate of fire	1,100-1,350 rpm
Mounting	bipod or tripod
Caliber	7.92 mm (.311 in)

There is no provision for single shots.

a. Comparison with MG 34

By comparison with the MG 34, several interesting new features are noted:

(1) Locking System

In place of the Solothurn rotating bolt-head of the MG 34, the locking of the bolt to the breech of the barrel is achieved by a wedge, which forces outward, and into suitable recesses in an extension of the breech of the barrel, two rollers on the head of the bolt. As the principle is not familiar to many, at least in its application to ordnance, a simplified diagram illustrative of its action is shown in figures 1 and 2, and a detailed sketch of its application to the M 42 machine gun is shown in figure 3.

UNLOCKED POSITION LOCKED POSITION

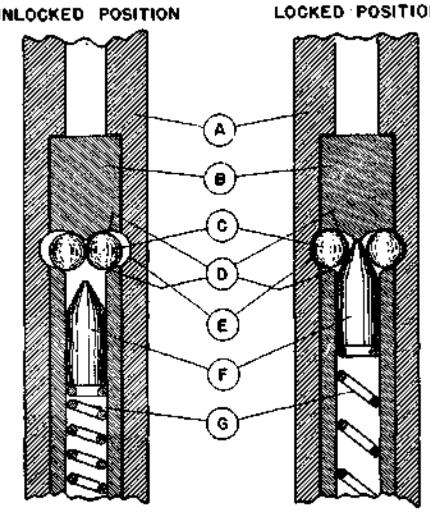


FIG. 1 FIG. 2

(a) Explanation of the Principle

It is desired to lock interior tube B (figure 1) securely, but temporarily, to exterior tube A. This locking is accomplished by means of circular (or in some cases spherical) bodies C, which are forced outward through holes E in tube B, into recesses in tube A by means of wedge F, actuated by spring G. When the spherical bodies C are in the position shown in figure 1, inner tube B is free to move within exterior tube A, but when spherical bodies C are thrust outward through the apertures in tube B and engage in the recesses in tube A, the two tubes, A and B are firmly locked together (see figure 2).

(b) Application in Model 42 MG

This principle is applied in the Model 42 machine gun as follows (see figure 3). On firing barrel A and barrel extension B recoil to the rear until rollers C are cammed inward by fixed cams D unlocking bolt head E and retracting firing pin F. The bolt carrier G and bolt-head continue to the rear guided by fixed guides H while barrel and barrel extension return to battery. On the return of the bolt, the impact of the roller with the camming surfaces I, the "spherical bodies" of figure 1 and 2 on the barrel extension carry the rollers from their seats, and, together with surfaces J on the bolt head, force the rollers outward locking the bolt head to the barrel extension. The initial outward motion of the rollers also frees the firing pin holder K which is driven forward by spring pressure insuring complete locking (by wedging rollers outward) before the firing pin can strike the primer. To extract the bolt-head from the barrel extension, the rollers must be pressed back with the thumb and finger inserted into grooves in the receiver.

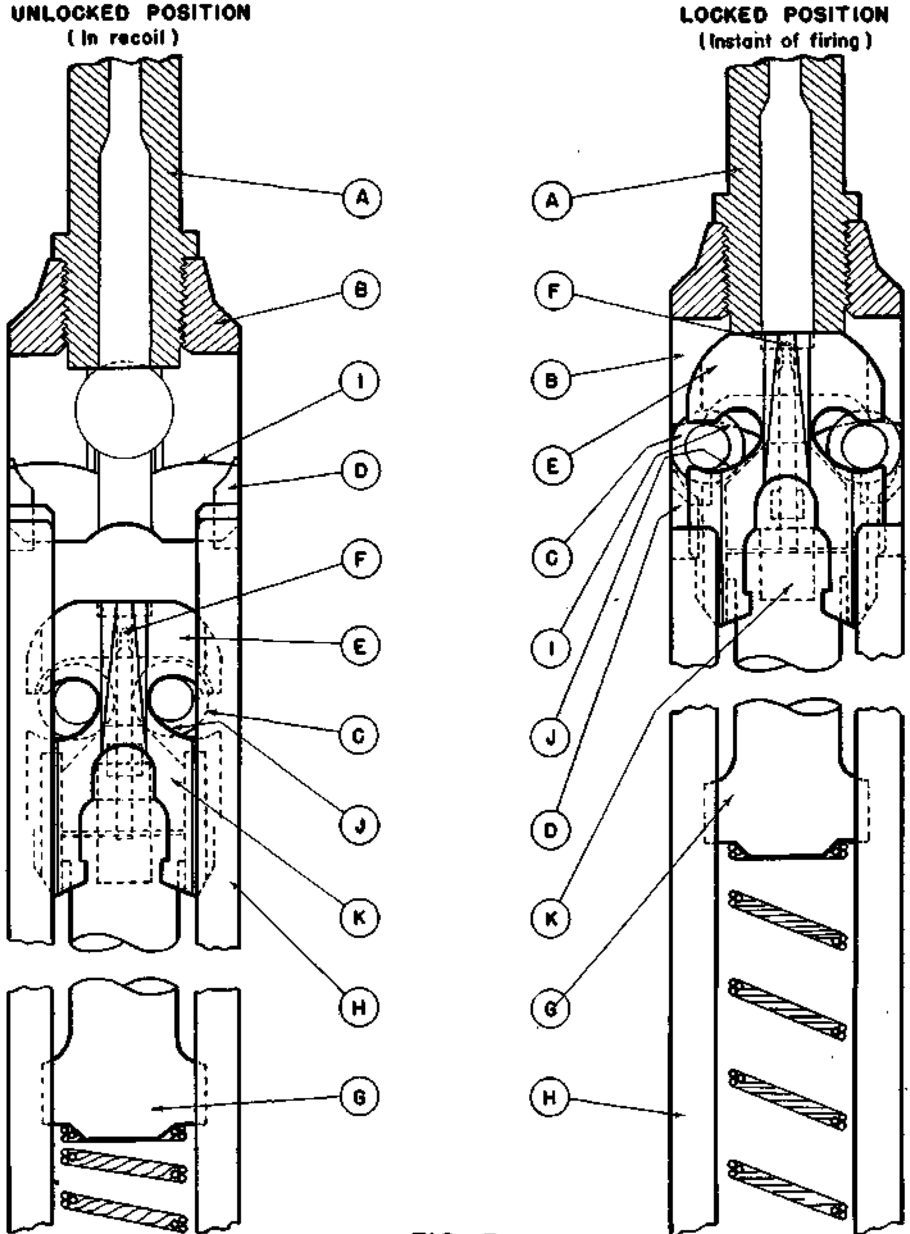


FIG. 3

BREECH BOLT, GERMAN MODEL 42 MG

The bolt-head can then be pulled out.

By this system, the gun attains a rate of fire of 1,100 to 1,350 rpm which would appear to be unnecessarily high for a ground gun, though of obvious value for AA fire; the cyclic rate of fire of the MG 34 is from 800 to 900 rpm. Preliminary trials show, however, that this high rate of fire has not been obtained without a certain decrease in accuracy compared with the MG 34.

b. Barrel Changing

The frequent barrel changing necessitated by the high rate of fire is met by the introduction of a rapid and efficient barrel-changing device. A barrel-change lever is hinged in the right side of the barrel casing, and can be swung outward bringing with it the barrel, which lies in a metal loop attached to the inside of the change lever. The barrel can then be slid out to the rear.

c. Unusual Feed Mechanism

Feed is by continuous metal belt through a feed block. As in the MG 34, operation is by a feed arm housed in the feed cover. In the MG 42, however, two feed pawls are linked to the front end of the arm by an intermediate link, in such a way that when one is feeding, the other is riding over the next round in the belt. The effect of this is that feed is in two steps instead of one step as in the MG 34, and is therefore much smoother.

d. Construction

The extensive use of pressing, rivetting and spot-welding in the construction (there are very few machined parts) gives the gun a less-finished appearance than is usual in German weapons. Considerable effort has been made to lighten the gun without the loss of strength - for example by making holes in the operating handle. There is no reason for assuming, however, that its life and performance are not up to the usual German standard.

17. PREMATURES IN GERMAN 20-MM FOUR-BARRELED AA GUN

A communication from a German battery commander that fell into Allied hands complains of frequent premature explosions of the shells in the gun barrels before the closing of the breech. In the case cited, the premature had ignited about ten rounds in the magazine, which in turn set off the magazine of an adjoining gun. Two men were killed, four badly injured.

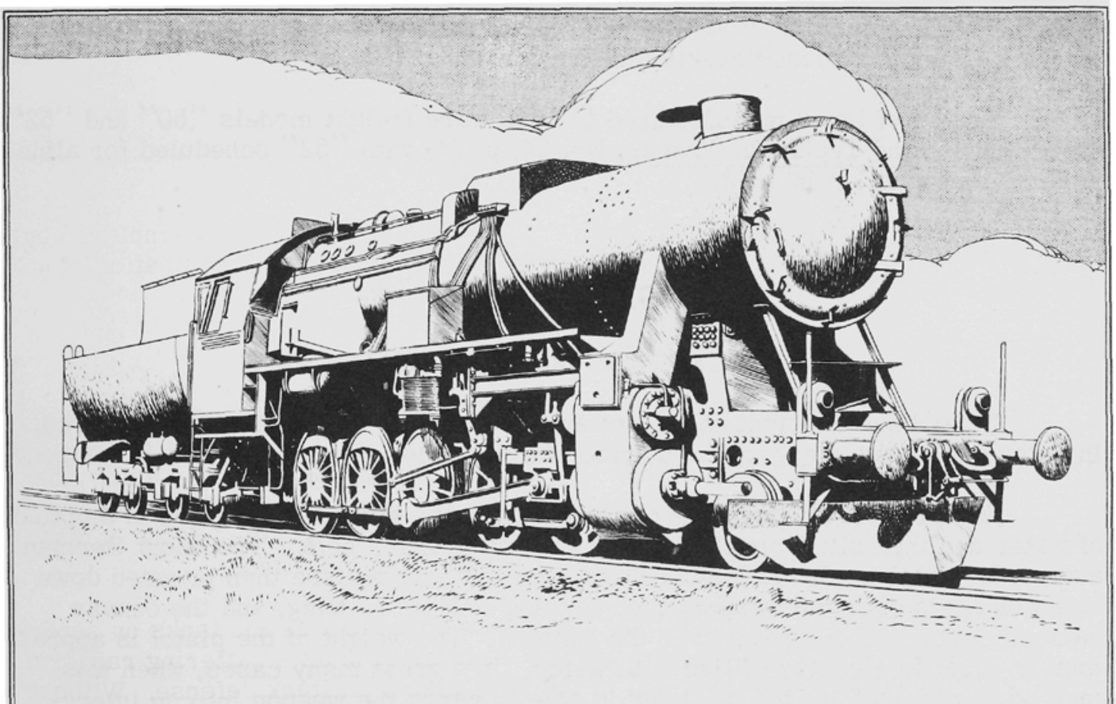
The writer suggested substituting for the over-sensitive ammunition, made between 1938 and 1942 with fuze AZ 5045, the armor-piercing Panzergranate 41. This ammunition may also be loaded with the 20-mm AP tracer self-destroying shell. As the complaint about the 20-mm four barreled AA gun applies with equal force to the single-barreled 20-mm Flak 38, appropriate precautions would appear advisable in handling any captured weapons of these types.

TRANSPORTATION CORPS

18. NOTES ON GERMAN ROLLING STOCK

It has been stated that the Nazis have accorded number-1 priority to transportation even to the extent of taking precedence over airplanes. Germany is vitally dependent on the smooth functioning of her transportation system. If this vital system which connects Nazi factories with their sources of supply and with their battle fronts, is put out of operation or seriously damaged, their whole war effort must obviously be retarded.

Some interesting developments affecting the transportation set-up, tending to reduce the consumption of construction materials and other valuable economies, have been recently reported in connection with the German locomotive and freight car situations.



GERMAN CLASS "52" LOCOMOTIVE

As was indicated in Tactical and Technical Trends, No. 24, p. 40, it was thought probable that the construction of the class "42" locomotive is to be started in 1944. This new type is said to be a refinement of type "52" (see sketch), has greater tractive power and is designed to meet the requirements of heavy freight traffic.

The same informed technical source responsible for the information mentioned in the foregoing paragraph, states that the dead weight of the railway

freight cars now manufactured in Germany has been reduced from pre-war levels by 25 per cent in the case of baggage cars, 34 for refrigeration cars, 29 for flat cars, 38 for box cars. However, the average carrying capacity for all types increased by 10 per cent.

The use of these new cars will provide the following chief advantages: saving of time and labor in manufacture, saving in construction materials, and enabling locomotives to pull additional cars.

The number of types of steam locomotives was reduced by the end of 1942 from 119 to 12. This included locomotives for military and privately operated railways (mostly small gauge), and in the case of electric locomotives, from 11 to 2, and from 97 to 5 for internal combustion locomotives.

The manufacture of additional types is continued in former locomotive works in Poland, Czechoslovakia and Hungary.

The chief types manufactured in 1942 were freight models "50" and "52" (see Tactical and Technical Trends, No. 24, p. 34) with "52" scheduled for almost exclusive production in 1943.

GENERAL

19. DECEPTION USED BY GERMAN PW'S

It has been reported that German prisoners of war about to be captured, in some cases have resorted to a trick which enables them to keep their weapons.

Just prior to the time they are captured, the aluminum canteen is emptied of water and then slit from the base of the bottle to the neck. The short German automatic pistol is placed inside the canteen. The sides are then pressed down together again over the weapon, thus keeping it from rattling, and the canvas canteen cover is then drawn over the canteen. The weight of the pistol is approximately equal to a canteen filled with water. In a great many cases, when this method is resorted to, the prisoner is able to carry the weapon into an internment camp, where it might be used for an attempted escape, or in any other similar situation which may be detrimental to his captors.

SECTION II

OPERATIONS OF AXIS MOUNTAIN TROOPS

OPERATIONS OF AXIS MOUNTAIN TROOPS

Before the war comes to a close, squads of American troops may well be roping across Alpine glaciers, groping for hand-holds up Balkan rock pinnacles, or dodging ice falls on the bleak crags of Norway. A description of how Axis mountain troops operate, taken from German sources except where elsewhere noted, would therefore appear timely.

It must be remembered that many of the European mountains are, as a rule, higher, rockier, more jagged, and desolate than those with which most Americans are familiar. Like the Canadian Selkirks, the Alps culminate in such tremendous snow-capped peaks as Mont Blanc or the Matterhorn, rising from ice fields and glaciers, storm-swept and dangerous, with deep-cut, stony valleys between. Rockfalls and avalanches are the ordinary risks of the Alpine mountaineer.

Eastward in the Tyrol the peaks are lower, and in the Balkans they are not high enough to wear snow in summer. Only two Balkan summits rise over 9,000 feet. However, the jagged Tyrolese and Balkan crags and pinnacles spring from jumbled masses of huge mountains, especially in Albania. They are extremely rugged, often forest covered, and riven by terrific gorges. Passes are few, and like the men of that land, rough and hard.

The forbidding Norwegian ranges, many lying north of the parallel of Nome, Alaska, or Labrador, are chilled by gales that roar across the ice floes straight down from the Pole. While not more than a thousand feet loftier than our Great Smokies or White Mountains, these wild peaks, with their low snow-line, great ice fields that come almost down to salt water, and sub-arctic weather, make them similar in many respects to the Alps. A peculiarity of the Norwegian mountain terrain consists of innumerable long, narrow lakes.

In visualizing operations in such highlands, one basic factor must always be borne in mind--the slowness of all military movement due to terrain, cold, and exhaustion, and the difficulty of command and supply.

What follows is based on German sources, except as otherwise noted.

* * *

a. Marching

A time allowance of one hour per 1,000 feet of climb and 1,600 feet of descent must be made in addition to that called for by the map distance. Because of the limited number of trails and the slowing-down of both men and animals due to fatigue, troops should be marched in smaller units than is customary on lowland

terrain. The maximum practical formation, is a company, reinforced by a battery, with a platoon of engineers pushed well forward to help clear the trail. [It may be noted here that our own Field Service Regulations suggest a reinforced battalion, which may be more practicable here than in Europe.]

This division into small self-sustaining units minimizes the risk of ambush, and each column can fight independently. To prevent small bodies of snipers from holding up the advance, single guns are placed near the head of the column. Both stationary flank guards and mobile patrols should be thrown out to secure high positions to the flanks. These elements rejoin the column as it passes. Where the climbing is particularly stiff, the infantry mingles with the artillery and pack train to help when necessary. Pack artillery moves at a walking pace. Rest-halts of three or four hours to permit the unloading of both men and animals are required every six hours. Short rests without removing packs are of little use. [Our regulations suggest regular short rests as well, which would appear to be absolutely necessary.]

b. Command

Warfare among the peaks is a severe test of the skill and leadership of the junior officers, as the operations of these small groups call for a high standard of training and discipline. Communications between forces scattered over many square miles of forest, rock or ice is difficult to maintain, and command problems are far more complex than in the lowlands.

c. Supplies

While transport aircraft may sometimes be used, one- or two-ton trucks, horses and mules, aerial cableways, pack animals, and manpower may all be required. A man will pack from 45 to 75 pounds; horses and mules not over 200 pounds.* Man-packing cuts heavily into the effectiveness of a fighting unit, because of fatigue and the employment of men needed for other purposes. (In the landing on Attu, a caterpillar tractor hitched to a pulley made fast to a "dead man" at the top of a cliff was used to haul up supplies.) Care should be taken to see that supplies are packed at the base in containers suitable for such transport. Normally, supply columns are organized into valley and mountain columns, the former carrying supplies for two days, the latter for one or two days.

d. Weapons

Naturally greater reliance is placed on lighter weapons than in ordinary combat. Light machine guns, and an extensive use of mortars tend to replace heavy machine guns and light artillery. Antitank and heavy machine guns are usually sited to cover road blocks. The effectiveness of artillery fire from valleys depends on carefully selected observation posts in communication with single guns. How difficult it is for artillery to operate in mountainous country cannot be overemphasized.

*U.S. Army load--no German figures given in source material.

The Germans have several types of mountain guns. One is the 75-mm infantry howitzer (7.5-cm l. I.G. 18--leichtes Infanteriegeschutz--light infantry gun) without the shield. It is only 10 calibers long, horsedrawn, and capable of being broken down into six loads of 165 pounds, maximum, each, for pack transport. With a 12 degree traverse, it has an elevation of from minus 10 degrees to plus 73. The projectile is a 12-pound high explosive shell with a percussion or time fuze, the latter in British opinion much more effective against rocks, where the instantaneous fuze is of little value. Five different charges are used with the following ballistic performance:

Charge	Muzzle Velocity (f/s)	Max. Range (yds)
1	310	930
2	368	1,260
3	440	1,750
4	565	2,680
5	730	3,880

This is probably the type of weapon most likely to be encountered.

A heavier gun, perhaps obsolescent, is the 75-mm mountain gun (7.5-cm Geb. K. 15--Gebirgskannone--mountain cannon). This 15.4-caliber gun weighs 1,380 pounds. The elevation varies from minus 9 degrees to plus 50 and the traverse is only 7 degrees. It is slightly more powerful than the weapon just described. The ballistics of the four charges with a 12-pound HE shell, with or without tracer, are:

Charge	Muzzle Velocity (f/s)	Max. Range (yds)
1	770	4,280
2	865	4,990
3	1,000	5,890
4	1,270	7,250

The gun breaks down into seven pack-loads, of which the heaviest, 330 pounds, would appear too heavy for packing by horse or mule.

Another gun is the 75-mm mountain gun (7.5 cm Geb. G 36). Why it is called a "gun" ("G". is abbreviation for "Geschutz" meaning "gun") when the other is called a "cannon" is not obvious. The Germans, like ourselves, use the terms interchangeably. No details of the piece are available, but is reported to fire the same projectile (not "ammunition") as the airborne gun (7.5-cm LG 40) described in Tactical and Technical Trends No. 26, p. 15. That weapon is a 320-pound recoilless, rifled, breechloader, throwing a 12.56-pound HE shell or a 10.05-pound hollow-charge shell, with a velocity reported to be 1,197 f/s and a range of 7,410 yards. Such a gun might, due to its lightness, be used as a mountain gun. It also can be broken down into separate parts.

There is a report of a 105-mm mountain howitzer (10.5-cm Geb. H. 40) but no details are yet available.

In the weapons list, grenades are not mentioned - perhaps they are taken for granted. In the East African mountain campaign in Eritrea during 1940-41, the Italians used a very light hand grenade, which the British report, produced "devastating effect". The resourceful British countered them with corrugated iron shields, and fabricated slings and catapults which threw them back at the Italians "with considerable accuracy" at ranges up to 100 yards.

Recently, a German publication suggested a mountain tank capable of taking gradients up to 45 degrees, narrow enough to travel mountain trails and of such a construction as to make possible sharp turns. The engine would have to be capable of functioning at 12,000 feet. Nothing definite is known concerning such a tank.

e. Training

In general, German mountain units initially receive the same basic training as infantry, with specialized training afterward. Battalion officers must be trained army mountaineering guides and each year pass tests. All guides must be adept at map reading and familiar with the use of the altimeter, be able to judge the weather and recognize mountain dangers. They must be capable of reaching difficult observation posts. As sound travels farther in the mountains than across flat country, great emphasis is placed on movement without noise. Troops are trained to be most economical in their expenditure of ammunition. As troops may be away from their organizations for days at a time, a high standard of discipline and hardness is required.

f. Notes on Reconnaissance, Communication and Engineers

Aside from its usual functions, mountain reconnaissance calls for the marking of trails where pack transport must be used, where the path should be improved, where the path is under enemy observation, and where troops will have to be responsible for their own transport.

"In the valleys, motorcyclists may be used for communication; on the heights, wire laying is most difficult and radio is the primary means of communication." The above abridged quotation fails to mention the fact that among the peaks are many dead areas where radio, especially short range, is unreliable, and wire or visual signals must supplement the radio. Jamming is possible and was experienced in the Attu operation. Heliograph, blinker, rockets and smoke all appear practicable. In their East African warfare, the British made extensive use of visual signals, with a curious development--the sewing of colored patches on the backs of assault troops' uniforms, so that they may be identified at long range and not fired upon by their own supports.

Engineers must understand the bridging of torrents, the making of mule trails, and the construction of aerial cableways. The British in Africa report such other activities as road maintenance, mine laying and lifting, demolitions,

reconnaissance, water supply, and when not otherwise usefully occupied, fighting. In Europe, protection against snow and the clearing of snowed-in roads and trails would be part of the engineers' work as well as the construction of defensive positions by blasting. In the more static phase of mountain warfare during World War I, a great deal of tunneling and underground warfare was waged on the Italian front, involving some blasts of the most gigantic proportions. An article on this subject appeared in Tactical and Technical Trends, No. 29, p. 39.

g. Tactics

(1) Attack

The early possession of commanding heights is essential for the security of forces moving in the valleys. The main attack, generally, will have to follow the valleys, as they alone give freedom of movement to a strong force and its supply trains. In attacking uphill with artillery support, there is danger of rock slides caused by the shells of the covering fire. Downhill attack is easier for assault troops, but presents tactical and ballistic problems for artillery.

Ordinary artillery was found by the British in Eritrea to be of little value, but pack-howitzers with a very high trajectory, and medium howitzers, if they can be gotten up, were most effective. It is to be presumed that the Germans will make full use of this experience.

(2) Defense

In defense it is better to have only the foremost defense areas on, or in front of, the crest, and to have the heavy weapons on the rear slope. This the British found to be the Italian method, augmented by machine-gun and mortar fire. The ancient, effective defense common to all primitive warfare, of rolling or blasting down rocks on attackers is not mentioned by either British or German sources used here, but the advantage of well-placed mines to start rock-slides is too obvious to be over-looked. In retreat, every single avenue of pursuit must, if possible, be blocked or mined, forcing the pursuers to storm high crags in the face of delaying fire. Demolition operations to blast roads or cover them with avalanches are particularly effective.

The British report frequent use of road-blocks covered by fire, and the use of intense defensive mortar- and machine-gun fire by the Italians, together with very wasteful fire at night that gave away their positions. British troops that had attained their objective were subjected to violent fire and counterattack. In their withdrawal through the mountains toward Keren in Eritrea, the Italians made full use of demolition tactics to delay pursuit.

On Attu, where the terrain was mountainous, the Japs used fog as cover and followed the edge of it up the mountain side. However, among the high peaks, according to experienced mountaineers, fog is apt to be unreliable cover.

h. Combat in Extreme Cold

The following German memoranda appear to be of unusual practical value:

(1) Marching

(a) Weapons must be covered.
(b) It is emphasized that clothing must not be too warm.
(c) Plenty of towing ropes should be loaded on the trucks.
(d) Advance guards should be strong, with heavy weapons and artillery well forward.
(e) Antitank weapons are distributed along the column.
(f) Ski and sleigh-borne troops are deployed to guard the flanks.
(g) Horse-drawn sleighs and handsleds are valuable for the transport of weapons and supplies.

(2) Halts

As opposed to normal mountain practice, halts must be short when the temperature is low.

Here occurs a rather unusual direction, worth quoting in full. "Motor vehicles must be parked radiator to radiator, snow removed from under the vehicles and some sort of foundation placed under the wheels." Presumably, during a lengthy halt, the trucks are pulled off the road, into deeper snow, which obviously must be dug away from the wheel tracks to prevent possible stalling. Probably, they are parked in woods or under cover, or camouflaged. Placed radiator to radiator, a tarpaulin could be thrown over the hoods and the engines kept warm. The foundation under the wheels would give starting traction. A suggestion as to camouflaging wheel tracks with fresh snow might have been in order.

(3) Restrictions to Movement

At zero temperatures the use of tanks and motorized equipment is limited. Tractors can negotiate snow slightly over a foot deep, but motorcycles are useless at six or seven inches. Snow is a tank obstacle when higher than the ground clearance of the tank. Gas consumption at very low temperatures is calculated to be five times normal. "Snow over 16 inches is not passable for pack animals." [It is to be doubted if Custer, Miles, or some of the other generals of the Indian Wars would accept this limitation; but the reason, perhaps, may be that in the Alpine variety of mountains, 16 inches of snow or over on the level will drift and block the trails until it is impractical to attempt pack train transport.]

Here it should be noted, that during the Norwegian campaign in April and May of 1940, the Germans drove motorized spearheads, including tanks and motorcycles, eastward from the Osterdal (valley) north of Oslo toward Hjerkinn and Inset through high passes, over narrow, sharply twisting roads where the snow lay from

six to ten feet deep. How it was done has not come to our knowledge, but neither the Norwegians, who certainly knew the country, nor the British, had considered it a possibility. The results would indicate that such snow-fighting equipment as bulldozers, rotary ploughs, and similar machinery were included in the German materiel.

(4) Weapons

Ranges are usually under-estimated in clear weather and over-estimated in fog. At low temperatures, weapons at first fire short. When visibility is bad, ammunition consumption rises.

(5) Reconnaissance, Communication, and Engineers

Among the extra tasks of reconnaissance caused by cold are, information as to the depth of snow, load capacity of iced streams, and danger of avalanches.

Scouts must remember that the enemy will use tracks in the snow to lead patrols into ambush.

Signs on stakes well above the snow or the marking of rocks or trees and the setting up of flags on poles are necessary to mark roads.

Line construction takes longer in extreme cold, and the cold and damp lower the efficiency of electrical equipment.

Engineers must understand the bridging of iced surfaces, bridge protection and maintenance against ice, and the blasting of the frozen surface of marshes.

(6) Tactics

(a) Attack

Assembly areas, in view of the difficulty of movement, must be farther forward than normal. Deployment must often be delayed till contact with the enemy is made. As a rule, limited objectives only are possible, but combined frontal and flank attacks will be made where possible. Commanding positions, which assume added value in cold weather, must be seized early in the action. To prevent surprise, or deal with surprise attacks, heavy weapons must be decentralized. In attack, ski troops are valuable.

(b) Defense

It must be remembered that obstacles take much longer to build in the cold. To make the enemy deploy early, strong outposts are required. The usefulness of snow as a protection against fire is often over estimated but ice fortifications and ice concrete can be employed as described in Tactical and Technical Trends, No. 22, p. 20.

CORRECTIONS

Index

No. 30, p. 46: In the section Antitank, opposite the reference to the "75-mm Antitank Gun," reported in issue No. 22, the page number should read 6 instead of 66.

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[redacted]

TACTICAL AND TECHNICAL TRENDS

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WAR DEPARTMENT · · · WASHINGTON, D. C.

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CONTENTS

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SECTION I

AIR

1. SOME FEATURES OF GERMAN AIR TACTICS

In a recent issue of the Red Star, the following article written by a Red Army Staff Officer, describes some features of German air tactics during the spring operations on the Eastern Front.

*　　　*　　　*

During the operations conducted this spring certain features of German air tactics stood out very clearly. Great air battles fought in the Kuban area and other regions of the front give many examples which characterize present tactics of the German Air Force.

In the first place let us note the use of very strong concentration of planes of all types for a blow on a chosen target. In order to achieve strong concentrations of planes at a given time on a target, the Germans, besides considerable regrouping of squadrons, use the following maneuver: groups of German bombardment planes based on airfields at a considerable distance from the chosen target take off according to a prearranged time schedule arriving over the target simultaneously, or within a very short time of each other. For example, during one raid in which several hundred bombers took part, the planes were over the target only 20 to 25 minutes. These planes flew from airfields widely scattered in depth and in front. Such a maneuver is often necessary as our Russian reconnaissance planes usually discover large concentrations near the front lines in time for our attack planes to disperse such concentrations. It is necessary to note that the maneuver described above is not always successful. Organizational difficulties, changes in weather conditions, and actions of opposing aviation often disrupt the plans of the German command. In one particular instance where five groups were to take part in a raid, only one reached its destination and was there dispersed by our air defense.

Combining both the concentration of planes on airfields near the front lines, and the air maneuver, Germans are often able to achieve strong concentrations of air power on a given target. This is done in the following manner: pursuit planes with limited gasoline capacity, and light bombers, are gathered on the airfields in the vicinity of the chosen target. For this purpose the Germans use squadrons trained for direct support of ground troops. The main force of bombardment planes follows a time schedule, taking off from widely scattered airfields.

The character of the German air attack depends on the air situation and the objective. If large numbers of fighter planes are available they arrive over the target ahead of the bombers. They endeavor to drive from the air the largest possible number of our fighter planes leaving the air over the target area uncontested to the bombers and their fighter protection. If sufficiently large numbers of fighter planes are not available, the bombers attack with almost no protection.

In the massed attack of fighter planes that precedes the appearance of the bombers each group of fighter planes echelons vertically and in depth in such a way that it can fight independently of the others. Missions of these groups are varied. Some groups composed mainly of Me-109's and FW-190's engage fighter planes, employing horizontal and vertical maneuver. Often during the course of the battle Germans detach groups of four or six of the most experienced fighter pilots in order to intercept our reinforcements. Other groups somewhat smaller than the first endeavor to secure control of the air over the target.

The following example drawn from actual battle illustrates German methods of attacking our bomber formations. A group of "Lagg 3" fighters was protecting an echelon of "Ilushin 2" bombers which were operating over a battle field. In the vicinity of the target our planes were met by German fighters. After trying to separate our fighters from the bombers, German planes, for the most part, Messerschmitts, formed an "echelon in line ahead" on the right side of our bombers while the fighter escort was echeloned on the left side. This maneuver gave the German fighters certain advantages. It was difficult for our fighters to intercept the attack against the bombers without subjecting themselves to fire from succeeding enemy planes; each enemy plane was protected by the following one; and enemy planes could take turns firing against the same target.

Germans have also changed somewhat their bomber formations. Typical of the formations used recently is a group of 30 to 40 Heinkels or Junkers which fly either in a wide formation or in groups of 9 to 12 planes "in line ahead" On some occasions the number of bombers in group was increased from 60 to 80 planes. During daylight hours these attack in large groups, while at night they attack singly or in small groups.

Against our ground forces Germans use low-flying or diving attacks made with the improved Junkers-87 which they call Panzerjagdflugzeug. It is now equipped with two automatic cannon, its speed is slightly increased (320 km/ph), and its range is increased. In combatting these attacks our "Ilushin 2" which has very strong armament is especially useful

ANTIAIRCRAFT

2. GERMAN AERIAL DEFENSE WITH ALL WEAPONS

Reproduced below is a German memorandum on defense measures to be taken by ground forces against air attack. It is both comprehensive and concise. For previous reference to this subject, see Tactical and Technical Trends, No. 30, p. 6.

(1) The activity of the enemy air force is directed against all resources of the German armed forces. It is, therefore, the duty of every single soldier and of all arms to combat enemy planes.

(2) The enemy plane can attack only when he can see you, your weapons, your vehicle or your tent. Avoid being "spotted" (sighted) from the air. The best protection against being seen is camouflage.

(3) Camouflage means adaptation to the forms and colors of the surroundings. Keep this in mind. Incomplete camouflage is better than none. However, an incorrect type of camouflage, such as the accentuation of color contrasts and the creation of noticeable shadows is worse than no camouflage at all. This will attract the attention of the enemy aviator.

Camouflage must be changed continually in accordance with the surroundings, background, weather, and even according to the time of the day. Efforts by each individual man increase the protection for all.

(4) On marches or at halts, in rest areas, while in readiness, attacking or defending, the leader must keep in mind to deploy the units, to disperse columns and marching groups, to keep proper distance between groups, as well as dispersal to the flanks. Gun emplacements of heavy weapons, preparations for combat of tanks, assault guns, and cars, must be carried out near groves, in town-alleys or gardens, or near haystacks, or at least in surroundings which lend themselves for camouflage purposes.

(5) Execute marches and movements, even of smaller units, as much as possible at night. Avoid crowding. No halts at crossroads, squares or narrow places. Strictest black-out discipline. If flares are released by the enemy, cease marching, stop cars, don't move--hold draft and pack animals.

(6) Bombing attacks and attacks by other airplane weapons cannot be successful if you acquire cover against fragmentation for yourself, your weapon and your vehicle by digging. Remember: dig slit trenches when engaged in tactical situations, even at temporary halts or employments.

Never dig a slit trench beneath a motor vehicle (tanks excepted).

(7) On marches, the leader will order at least one man per platoon as an air guard; if troops are being transported on motorcars, at least one guard per truck.

(8) 20-mm AA self-propelled guns will always be ready for combat. Motorized troops must have the AA machine guns on trucks ready for combat. Keep sub-machine guns handy, distribute ammunition.

(9) On halts and in rest areas, designate a responsible superior for antiaircraft defense. Keep antiaircraft machine guns in readiness (in triangular formation).

(10) Weapons must be camouflaged. Fire only if the object to be protected is attacked and if the airplane is within range of the weapons.

(11) If an air attack is imminent, cannoneers and machine gunners will not leave their posts.

(12) Cannoneers and gunners are not to be used as air sentinels.

(13) Each target must be combated with several types of weapons. Designate one gun or machine gun to be on the alert, in order to open fire at a moment's notice, and to concentrate fire on the target by platoon or machine-gun section.

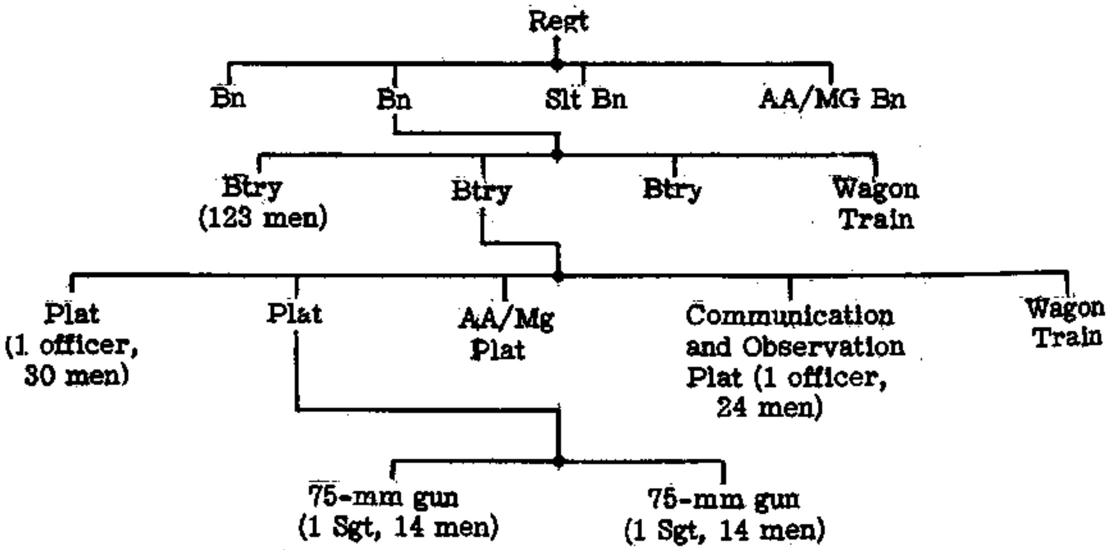
(14) Keep calm and don't get excited. To prevent damage by bombs or other airplane weapons and to efficiently repulse all attacks, act cautiously but quickly.

(15) There is no such thing as "air-terror".

3. ORGANIZATION OF JAPANESE AA REGIMENT

Recent evidence has thrown light on the organization of Japanese antiaircraft units about which little was previously known.

The organization of an AA regiment is believed to be as follows:



A battalion therefore consists of 12 guns and a regiment of 24 guns plus a number of 20-mm AA/MGs. AA regiments are army troops, the battalion normally being the tactical unit.

In the Southwest Pacific the Japanese appear to have frequently used two-gun positions with AA/MGs sited near the guns. In Burma, however, four-gun positions appear to have been more normal.

ANTITANK

4. TACTICS OF GERMAN ANTITANK ARTILLERY

The following summary from British sources gives some recent information on the German antitank tactics. It includes notes on the theory of this type of fighting and on actual experiences from battle areas.

*   *   *

a. Antiaircraft Artillery in Antitank Role

A german artillery general writing in a newspaper article, stated that the AA artillery has long outgrown its original role. It has, indeed, still to undertake the AA protection of the forward positions and lines of communication, but these duties are carried out, as it were, on the side. Elements of AA artillery are now placed in the main line of resistance, and kept in a mobile condition. Their chief purpose is antitank defense, which they carry out by allowing the tanks to close to very short ranges. The first round should be, and often is, a direct hit on a vital spot. Furthermore, units of AAartillery may be also used as field artillery. They are placed in the field artillery area from 2,000 to 4,000 yards behind the main line of resistance, have their own OP's and perform all the normal artillery tasks.

b. Simultaneous Use of Various Calibers in AT Defense

Two papers, apparently from the German tank school, dealing with antitank tactics on the Russian front, state that 37-mm AT guns, although adequate against most Russian tanks, must be used in conjunction with 50-mm and, where possible, with 88-mm guns. AT guns should be concentrated in centers of resistance.

The papers also stress that long fields of fire are often a disadvantage; the ideal field of fire is that of the effective (not the maximum) range of the gun. Enfiladed positions, and positions on reverse slopes are becoming more important. Dummy positions are very important in making the heavy Russian tanks waste the small issue of ammunition carried. Mines in front of the guns are useful in view of the Russian habit of making small raids at night in tanks equipped with blinding headlights or searchlights.

At night always, and by day usually, a 37-mm AT gun with hollow-charge ammunition should be kept ready for action. Camouflage must be good, and fire

held till the last moment, as more than one shot is scarcely ever possible.

c. Layout of Gun Positions

A British antitank regiment has supplied some interesting notes on the layout of the enemy antitank defenses in Africa.

(1) In general, gun pits appeared to be sited with no attempt at defilade; there were few instances of guns being in mutual support of each other. The 88-mm pits and the majority of pits for the 47-mm Italian guns were in the main line of resistance. There did not appear to be much depth in the layout of either of these types. The 20-mm Breda guns were in the rearward emplacements, thus giving a certain degree of depth to the position.

(2) Two 88-mm pits were examined, both well up in the main line of resistance--one was in fact sited in an opening in the foremost double-apron fence, about 50 yards in front of which was a low trip-wire. The gun was sited to fire straight to the front down a valley, to a distance of about 3,000 yards. Both AP and HE shells were found in this pit. The second pit was similar, but did not have as long a field of fire.

(3) Only two 47-mm pits were found in which there had been any attempt to get defilade from the front. None of these is considered to have been well-sited. In the majority of cases, pite were found (often in pairs about 50 yards apart) in the main line of resistance and sited to fire straight out over the wire, which was, on an average, 40 to 50 yards distant.

d. Company Tactics in Africa

(1) Tactics in a Static Role

The German antitank company commander is given a sector to defend, which he sub-allots to platoon commanders. Each gun in a platoon is then given a definite sector within which the No. 1 of the gun has complete freedom of action. Fire was not controlled by the company commander. Rapid changes of position were possible only with the aid of tractors which were kept as near as possible to the gun positions. There were no drag-ropes on the guns and manhandling beyond a few yards was exhausting.

(2) Formation When Advancing

The company formation was for the three platoons to advance in line of platoons. Two guns in each platoon were forward, about 200 yards apart, and the third gun in support 200 yards behind, and equidistant between the forward guns. The distance varied, however, to suit the ground. When cooperating with, and protecting the flanks of tanks, a liaison officer was assigned to the tank unit by the antitank battalion.

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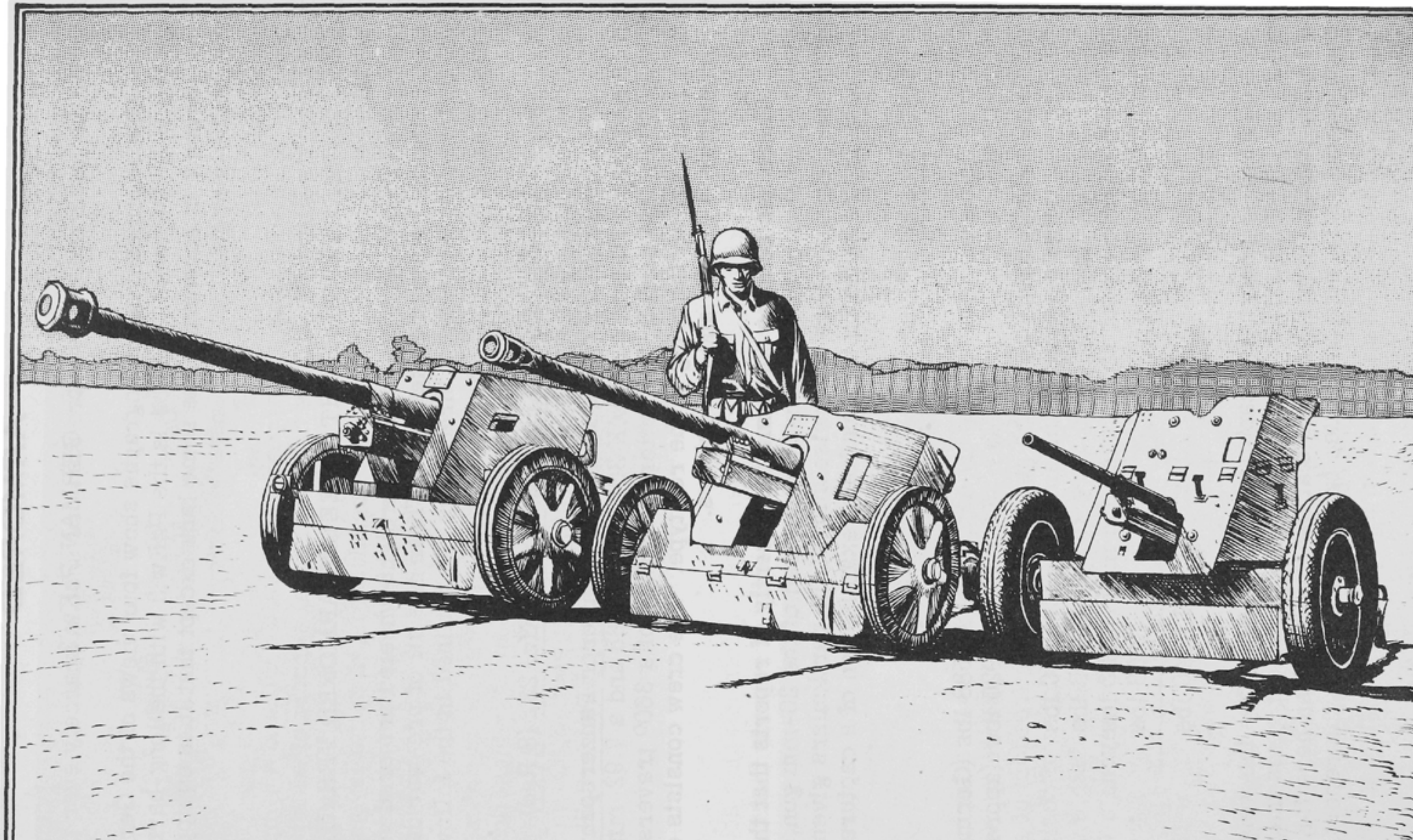

COMPARISON OF GERMAN

75-MM, 50-MM, AND 37-MM ANTITANK GUNS

5. GERMAN PzKw 3

The accompanying photographs show four views of the German medium tank PzKw 3. Figures 2, 3 and 4 is the PzKw 3 with the long-barreled 50-mm gun. Figure 1 is essentially the same tank except that it is equipped with a short-barreled 50-mm gun.

6. GERMAN EIGHT-WHEELED ARMORED VEHICLES

The three main types of German eight-wheeled armored vehicles are shown in the accompanying sketches. These are all of pre-war design. The principal differences between the three types are outlined in the following report from British sources:

a. Eight-Wheeled Heavy-Armored Car Sd. Kfz. 231 (8 Rad)

This armored car called in German Schwerer Panzerspähwagen Sd. Kfz. 231 (8 Rad) has a 20-mm gun Kw.K 30* or Kw.K 38 and a 7.92-mm MG 34 mounted coaxially in the turret. The latter is capable of a 360° traverse. It is equipped with a radio, the aerial being of the rod type. The crew consists of four men - a commander, a gunner and two drivers.

There has been no confirmation recently of reports that the 37-mm Kw.K was to be mounted in this armored car instead of the 20-mm gun. Details of this car follow. (Except where otherwise stated, the particulars given below on the three models are based on the results of examination of a captured vehicle).

(1) Weight

Unloaded	16,588 lbs (German document)
In action	17,920 lbs (approx)
Axle loading	
1st axle	4,340 lbs
2nd axle	4,396 lbs
3rd axle	4,536 lbs
4th axle	4,368 lbs
	17,640 lbs

NOTE: A report on a captured vehicle estimates the weight loaded of this vehicle as 17,640 pounds, whereas a German document gives the weight in action as 18,256 pounds. It will be noted that the figures given here for axle loading, power/weight ratio, etc., are based on the estimate in the report.

*Kraftwagenkanone - tank gun or vehicle gun

FIG. 1

FIG. 2

Pz Kw 3

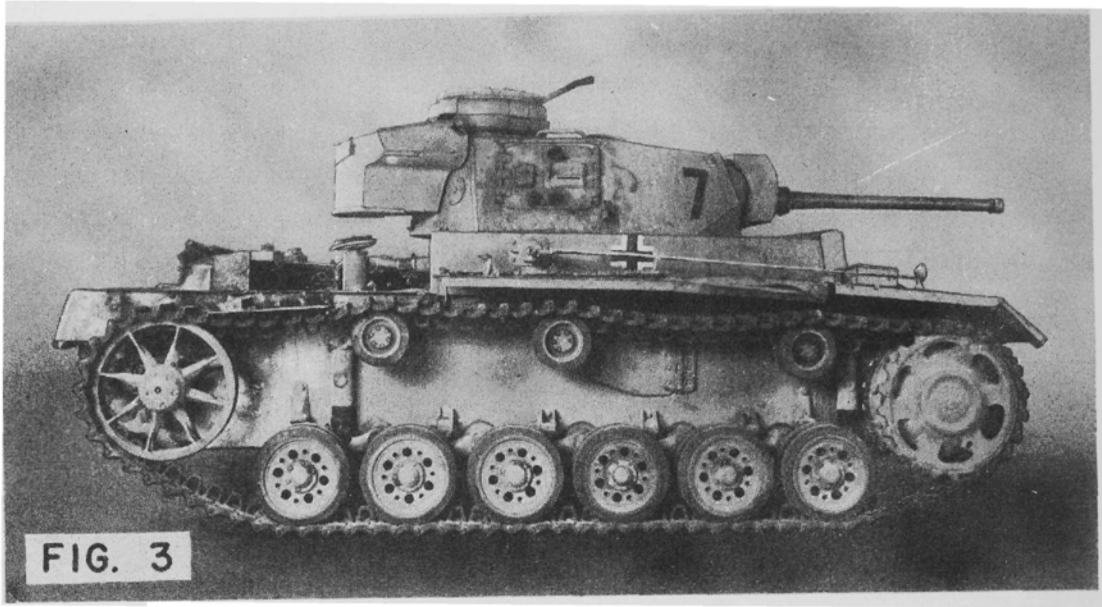

FIG. 3

FIG. 4

Pz-Kw 3

(2) Armor

Welded construction. Brinell* hardness of plates 450 to 500. An extra V-shield .39 inch thick is mounted about two feet in front of the nose of the vehicle.

(a) Turret

Plate	Thickness	Angle to Vertical
Front (except gun mantlet)	8 mm (.31 in)	25°
Front (gun mantlet)	15 mm (.59 in)	25°
Sides	8 mm (.31 in)	28°
Rear	8 mm (.31 in)	30°
Top (front)	5 mm (.19 in)	78°
Top (rear)	5 mm (.19 in)	88°

(b) Hull

Front (upper)	8 mm + 10 mm (2 feet space) = 18 mm (.709 in)	45° (on front shield)
Front (lower)	8 mm + 10 mm (2 feet space) = 18 mm	30° (on front shield)
Sides (except engine compartment--upper)	8 mm (.31 in)	40°
Sides (except engine compartment--lower)	8 mm (.31 in)	37°
Sides (engine compartment)	10 mm (.39 in)	(see sides above)
Rear	10 mm (.39 in)	20°
Drivers plates (front and rear)	8 mm (.31 in)	28°
Top (glacis plate)	5 mm (.19 in)	71°
Top (rear deck and engine cover)	5 mm (.19 in)	83°

(3) Armament

One 20-mm Kw.K 30 or Kw.K 38; one 7.92-mm MG 34. Both are mounted coaxially in flat mantlet and both fired by pedals on gunner's foot rest.

Maximum elevation	11° 35
Maximum arc of elevation	33°

One 9-mm sub-machine gun M.P(Maschinenpistole-machine pistol) 38 or M.P 40 is also carried as part of the equipment.

*See Tactical and Technical Trends No. 18, p. 34.

(4) Ammunition

20 mm	180 rounds (10 round magazines)
7.92 mm	2,100 rounds (150 round belts)
9 mm	192 rounds (32 round magazines)

(5) Sighting

Coaxial sighting telescope T.Z.F. 6 (Turmzielfernrohr)

(6) Turret Traverse

Manually operated 360°

(7) Dimensions

Length	19 ft 1/2 in (21 feet including spaced shield in front)
Width	7 ft 3 in
Height	7 ft 10 in
Wheel track	5 ft 4 1/2 in (axle shafts horizontal)
Wheelbase (overall)	13 ft 5 1/2 in
Wheelbase (bogie)	4 ft 5 1/8 in
Bogie centers	9 ft 1/4 in
Belly clearance	12 in (to front differential casing)
Ground clearance	9 in (to front axle shield)

(8) Performance

Speed:	
Maximum	50 mph
Cruising	33 mph
Cross-country	19 mph
Acceleration (standing to 1/4 mile)	26.4 mph
Braking (dry, level concrete) at above speed	11.70 fss*(hand)
	18.90 fss (foot)
Trench crossing	5 ft (estimated) at least
Step	1 ft 7 in (German document)
Fording	2 ft (limited by starter solenoid box)
Gradient (restarted successfully)	23°
Radius of action:	
Roads	165 miles
Cross-country	110 miles
Angle of overturn	30°
Tilting	11° 30

*feet per second per second

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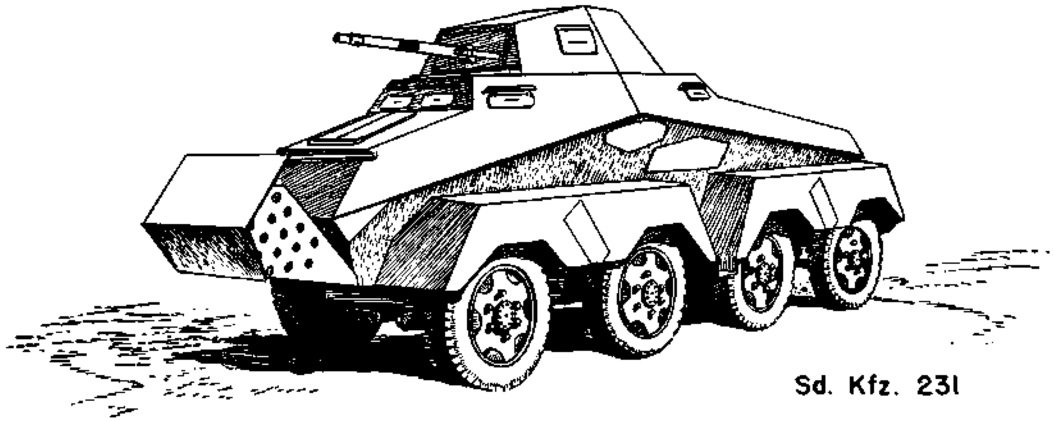
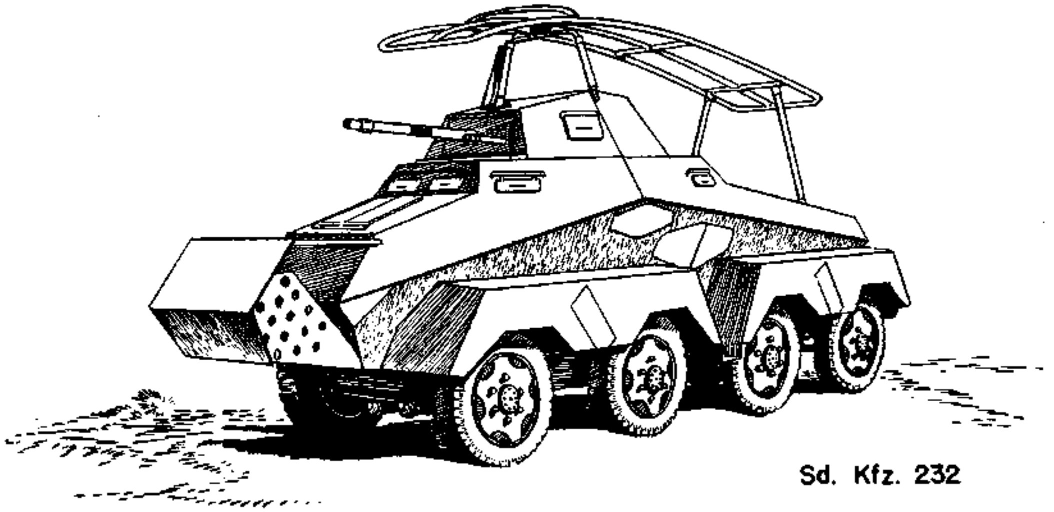
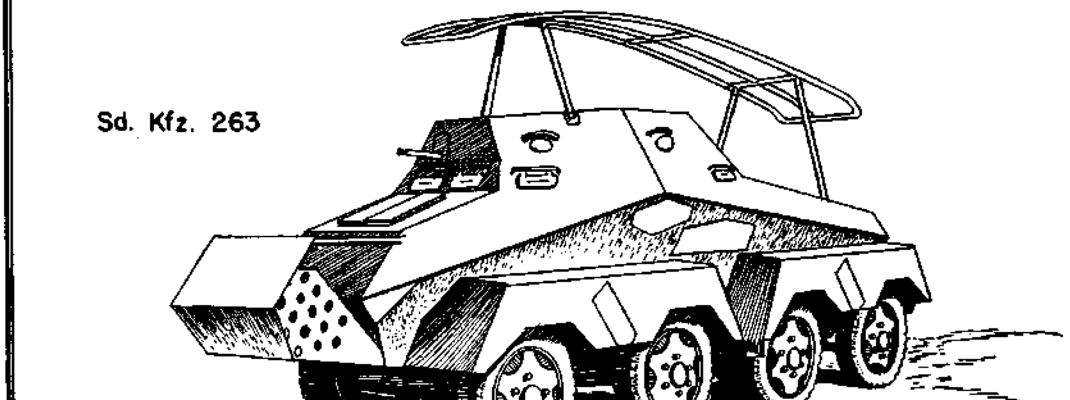


Sd. Kfz. 231



Sd. Kfz. 232



Sd. Kfz. 263

GERMAN 8-WHEELED ARMORED VEHICLES

(9) Engine

Maker	Bussing-NAG
Type	8-cylinder, 90° V-type, OHV, gasoline
Bore	107 mm
Stroke	110 mm
Capacity	2 gals
BHP*	155 at 3,000 rpm (makers rating)
Maximum torque	361 lb-ft at 1,500 rpm (estimated)
Firing order	1, 2, 7, 3, 4, 5, 6, 8
Compression ratio	5.5:1
Weight (dry)	1,344 lb
Weight per BHP	8.67 lb

(10) Power/Weight Ratio

BHP per ton	19.7 (see Note at 1, above)

(11) Fuel Capacity

Main tank	24 gals
Auxiliary	6.5 gals

(12) Consumption

Roads	5.43 mpg
Cross-country	3.80 mpg

(13) Clutch

Type	2 plate, dry
Outside diameter	10.945 in

(14) Brakes

Type	Wedge-operated, two-shoe
Control	Rods and cables, no booster

(15) Steering

Type	Worm and nut
Maximum lock angle (wheel)	26 degrees
Turning circle diameter	37 ft 5 in
Number of turns of wheel, lock to lock	4 (front) 3 1/2 (rear)

*Brake Horse-Power

(16) Gearbox

Type	Constant mesh, helical gear
Ratios	6 forward, 6 reverse
Control	2 levers and 1 pedal at each end
Weight	390 lb (dry)

(17) Final Drives

Primary reduction	Helical spur gears, ratio 1.632:1
Secondary reduction	Spiral bevel gears, ratio 3.2:1
Overall ratio	5.222:1
Differentials (inter-axle)	De Lavaud roller free-wheel type
(inter-wheel)	Z. F. cam type

(18) Overall Ratios and Speeds

Speed	Gear Ratios	Road speed (approx) mph at 3,000 rpm of engine
6th	6.06:1	50
5th	8.93:1	33
4th	15.97:1	19
3rd	21.05:1	14
2nd	31.02:1	9
1st	55.46:1	5

(19) Suspension

Type	Semiindependent
Springs	Leaf, inverted, semielliptic
Ratio (sprung to unsprung weight)	5.743:1

(20) Tires

Type	Low-pressure, cord-reinforced
Size	8.26 x 18 in

(21) Intercommunication

Radio telephone, rod-type, aerial

(22) Vision

Commander's periscope
Vision openings with laminated glasses and armor flaps.

b. Eight-Wheeled Heavy-Armored Car (radio) Sd. Kfz. 232 (8 Rad)

This is the same as the Sd. Kfz. 231 as regards armament and traversing turret. The German name for it is Schwerer Panzerspähwagen (fu) Sd. Kfz. 232. The radio set, however, is provided with a large, horizontal, overhead aerial frame, which extends approximately the whole length of the vehicle and is curved down at each end. The aerial is mounted on a pivot above the turret at the front, and on two supports at the rear of the vehicle. The pivot mounting at the front permits the turret to traverse, but when the turret is traversed to the rear, there would appear to be a danger of shooting away the supports at low elevation, and the rear of the aerial at high elevation. The crew is four as in the Sd. Kfz. 231.

Specifications are the same as for the Sd. Kfz. 231, except in the following particulars:

(1) Weight

Unloaded	16,912 lbs
In action	18,704 lbs

(2) Ammunition Carried

20 mm and 9 mm	As for Sd. Kfz. 231 (8 Rad)
7.92 mm	1,500 rounds (150 round belts)

(3) Height

9 ft 6 in

c. Eight-Wheeled Armored Command Vehicle Sd. Kfz. 263 (8 Rad)

This vehicle, called in German Panzerfunkwagen Sd. Kfz. 263 (8 Rad), has a fixed turret slightly larger than the turrets of the armored cars, and carries a large overhead aerial frame of the same general type as that of the Sd. Kfz. 232.

However, the aerial in this case is supported by stays at the front and on top of the turret, and two at the rear of the vehicle. Two additional supports are sometimes fitted in the center. One MG 34 may be fitted, though no armament was fitted in one of these vehicles examined in the Middle East. The crew is five including two drivers.

Specifications are the same as for Sd. Kfz. 231 (8 Rad), except in the following particulars:

(1) Weight

Unloaded	16,576 lbs
In action	17,808 lbs

(2) Crew

Five

(3) Armament

One 7.92-mm MG 34 may be fitted
One 9-mm sub-machine gun, M.P 38 or M.P 40

(4) Ammunition

7.92 mm	1,000 rounds (100 round belts)
9 mm	192 rounds (32 round magazines)

(5) Height

9 ft 6 in

(6) Turret Traverse

Nil

(7) Radio aerial

Horizontal, overhead frame type.

d. Conclusion

In all three vehicles, the chassis is basically the same. The engines and chassis are usually, if not always, made by Büssing-NAG and the hulls and turrets by Deutsche-Werke of Kiel.

An extra V-shield .39 in thick is fitted about two feet in front of the hull to increase protection. The sides and bottom of the space between the shield and the front of the hull are closed by perforated plates so it can be used for stowage.

In addition to the above three main types, there has recently been introduced a new turretless type carrying a 75-mm (2.95 in) gun.

These vehicles are designed to travel in either direction at approximately the same speed. An interesting characteristic is that all eight wheels are used in steering.

Comment: Because of lack of axle rigidity, due to the semiindependent suspension system, the mobility of this vehicle is adversely affected when applying the power in mud, sand, snow or dust. Under these conditions the vehicle has a tendency to deflect.

ARTILLERY

7. ARTILLERY AND TANK COOPERATION--ENEMY METHODS

In the following article reproduced from the Soviet Red Star, a Russian major emphasizes the decisive importance of close and rapid cooperation between artillery and tanks in the attack. The methods outlined are, in effect, an application of the same principle of cooperation so often stressed by the Germans.

*   *   *

Tanks are protected by armor, and are armed with guns and machine guns. In comparison with other services, tanks have many advantages in the way of maneuverability and striking power. Many military leaders placed all their hopes on armored forces, allowing only a secondary role to artillery. However, the experience gained in this war has shown that the role of artillery is not lessened by the presence of large numbers of tanks. On the contrary, it is increased. Tank attacks demand efficient cover by artillery fire. As a rule, tank attacks without the support of artillery come to a standstill.

Modern defense consists, above all, in antitank defense. The presence of various means of defense against armor, disposed along the front and in depth, well camouflaged, enables the defense to resist tank attacks in mass. To disclose and overcome all these means is not within the power of tank troops themselves.

Observation from tanks is difficult. Their range of fire is limited; accuracy of fire is comparatively poor. It is difficult to aim from a fast moving tank, which sinks into hollows and climbs obstacles. Forced halts even momentarily, increase the vulnerability of tanks. In such circumstances their advantages such as maneuverability, armament, striking power, cannot be fully utilized. Assistance is provided chiefly by the artillery.

The question arises of the efficient employment of artillery in support of the tanks. First, let us remember the varied nature of the tasks which the artillery can carry out. Artillery fire still possesses the greatest power and range. It can cover the movement of tanks to their assault positions, to their objectives and in the actual attack. It can put down concentrations after the attack, hold up enemy counter-attacks, and cover the evacuation of damaged tanks from the battlefield. The artillery prepares the breakthrough of massed formations of tanks, as well as assists in the movement of individual tanks. The methods employed are varied, depending on the size and characteristics of the task. Fire concentrations, changes in trajectory, lifting fires as the tanks move forward, displacing forward with the tank attack--all these may come into play.

The artillery missions must be planned for all aspects of the battle. The enemy will endeavor to forestall and break up our tank attack. For this purpose he will use long-range fire of two or three batteries, aimed at the route of approach of the tanks, at the areas of concentration and at assault positions. He will also use aircraft for this purpose. Therefore, the first task for our artillery

is to cover the approach of our tanks and their concentration by means of counter-battery fires and antiaircraft defense.

While silencing the enemy batteries it must be remembered that long-range fire originates from reserve positions, of which there will be several. These must be located beforehand, so as to be able to reply immediately to the enemy's opening fire. Enemy batteries will not fire accurately without observation. Consequently, during the period of artillery reconnaissance of the hostile defense position and later, the enemy's observation posts must be destroyed or rendered useless.

Counter-battery fire must also be used after the tanks have started to advance. The Germans meet attacking tanks with a barrage at a distance of 2 1/2 to 3 miles. Our artillery must then endeavor to intensify its fire against enemy batteries, force their gun personnel to take cover in trenches, and hinder the enemy's fire control.

The principal and most difficult task of the artillery is to disorganize the enemy's antitank defenses. Often our gunners open fire against the front line of defense, thinking that antitank guns and obstacles are situated there. Actually, the greater part of antitank obstacles are below the ground, camouflaged. Ammunition should be saved at the beginning of the battle for a more opportune moment for destroving hidden objectives.

As the tanks approach the forward edge of the enemy's defenses, the work of the artillery becomes more complicated. The requirements are speed and flexibility of fire control. The tanks will be meeting with obstacles. Enemy guns, situated in the immediate vicinity of the forward edge of their defense positions will open up. Our batteries will have to change over to firing on the forward edge of the hostile position and their fire must accompany but not damage our tanks.

The method of accompanying fire is the systematic concentration on certain targets. The effort to attain accuracy must not entail any delay. Often a complete barrage of bursts is most desirable, especially as the Germans have now abandoned their system of an interrupted line of defense. Intensive fire, opened without delay, even if inaccurate, will reduce the effectiveness of his antitank defense.

When attacking tanks are accompanied by artillery fire, the latter is provided by all the guns giving close support to the infantry, as well as by part of the long-range batteries. The latter's task is, chiefly, to isolate the attack objective throughout the depth of the enemy position, to neutralize the reserves thrown into the gap and to prevent counter attacks. Fire is controlled from command posts, well forward. Attention must be paid to signals and fire correction by forward observers in tanks equipped with radio.

Targets which appear after a barrage has been fired, or targets which have been hiding in shelters, or defended positions which are situated outside the areas taken under fire, must be dealt with by support weapons. Such support guns

accompanying the tanks must quickly destroy anything obstructing the tanks in their task.

After a thrust into their positions the Germans immediately organize a counter-attack with the help of reserves placed well to the rear. These counter-attacking groups consist chiefly of tanks. In one action, five of our tanks, accompanied by four guns, were counter-attacked by 18 enemy tanks. Our antitank weapons moved at a distance of 400 to 500 yards from our tanks. As the Germans devoted all their attention to our tanks, our guns opened fire on them. After firing 30 shells, two enemy tanks were on fire and four others damaged. The rest withdrew and our tanks successfully completed their task.

Recently, increasing attention has been paid to tank support artillery. Methods are being studied of the best cooperation with tanks. In this connection, the following is an example:

An infantry unit was ordered to capture an enemy position in a village. Tanks took part in the battle. A battery of 45-mm guns was detached to accompany the tanks. The guns were towed by the tanks by means of cables, and the crews, armed with automatic pistols, together with part of their ammunition were carried on the tanks. It looked like an artillery raid. Approaching the forward edge of the defense, and after taking the front line of trenches; the gunners shot up the Germans with their automatic rifles while defended positions were dealt with by the tank personnel. Later the tanks met with obstacles and the Germans started a counter-attack. Our gunners then unhitched their guns and firing over open sights, they drove back the enemy. This may not be a typical example, as these gunners were acting as infantry, but the fact that the guns were towed by tanks, and crews carried on the latter, is worthy of attention.

The usual method of moving guns behind tanks is for them to advance by their own traction, at distances of 200 to 300 yards from the tanks, in bounds from one position to the next. In this way the guns can cover the flanks of the tank units from counter-attacks and from flanking defense positions, which are the most dangerous of all for tanks.

ENGINEERS

8. NOTES ON CAMOUFLAGE

a. General

"Camouflage" as stated in Military Intelligence Service Information Bulletin No. 13, "is any and every means of hiding or disguising yourself from the enemy; misleading him as to your position, strength, and intention; confusing him so that he wastes his blows and falls into your ambush." A British source states, "not concealment, but invisibility is the object." These two quotations appear to cover the whole scope of camouflage. The following are some practical

notes on a phase of military activity which can not be too firmly impressed upon troops in the field. Not only our own lives, but the success of a vital operation may depend on the intelligent understanding of camouflage and also upon strict camouflage discipline.

b. German Instructions for Concealment of a New Main Defensive Zone

The following directive, issued by the commanding general of the 164th Light Division on the 19th of October, 1942, in Africa, is of interest as an illustration of the pains taken to conceal the shifting of the main defensive zone to the rear. (Aircraft observation had however disclosed the movement to the British before the order was issued.)

164 Light Africa-Division.
Ia:

Div Hq., October 19, 1942

Subject:- Concealment of the New Main Defensive Zone

To: Regt. and Bn. Comdrs

The whole process of moving the main defense zone to the rear will only have served its purpose in the long run if we succeed in deceiving the English for as long as possible and in concealing the whole move from them. Otherwise the troops will have to suffer from enemy fire just as much in the present unfinished positions as they did before.

I therefore make regimental and battalion commanders personally responsible for doing everything in advance which will make the rearward move achieve its essential purpose.

To this end the following points must be observed:

(1) Prevention of obvious movement in sectors under enemy observation.

(2) Thorough camouflage and complete cessation of all movement on the appearance of enemy aircraft. Enemy fighters too have eyes and take photographs. In such cases every man will take full cover and will not come out and run around just to watch the performance in the air, as almost invariably happens at present.

(3) Good reconnaissance and judicious layout of the supply routes, as far as possible running forward over dead ground to the various sectors.

(4) Erection of notices "Caution," "Look out," "Enemy observation"; and if necessary, fencing off, or the posting of traffic guides.

(5) Camouflage of Hqs. No bunching to attract attention.

(6) In contrast with the main defence zone, no complete cessation of hitherto normal movement in the new main line of resistance. Since the troops in front in the old positions are now numerically weaker they will have to give signs of greater activity.

(7) Extremely close watch by all infantry and artillery OPs. Nothing which the enemy is doing must escape notice. Is the enemy intensifying his reconnaissance activity in the next few days?

(8) Observation of enemy shelling. Is he firing onto the new main defence zone? Where? How many rounds?

Only if every man in the Division follows these instructions will the better situation of the main defense zone be made to result in greater security at all points with consequent benefit to the troops.

Sgd. Lungershausen

Another order from Hq xth Corps (German) to the Pavia Division reads as follows:

We must give the enemy the impression that new forces have arrived from the south, and that we intend to take the initiative there. The following measures should be taken:

(a) All motor transport and a few tank units should move about day and night in the forward area.

(b) Bring motor transport at present in forward bases right up to the line, and make dummy transport and tank positions, using blankets and other material.

NOTE: According to another source the tanks of one tank regiment were camouflaged as trucks by means of steel frames and canvas-painted sides, and were well forward. Stationary dummies made of cardboard were well behind.

c. Camouflage of an Allied Advance Headquarters

A scheme for the camouflage of an advance division headquarters on the African desert which appears to have been completely successful illustrates the use of simple materials, locally available. The headquarters was far forward--within a mile of the front line, and consisted of a number of elephant iron* Quonset shelters dug in to ground level.

Positions were chosen behind small rises, some no more than 2 or 3 feet high. Digging was done at night and the construction of 8 to 10 dug-outs was carried on at one time. By day, the holes were covered with a fully garnished

*Huts made of a half-cylinder of massive, corrugated-steel sections.

net, consisting of about 30 percent of white rags, and the remainder of burlap. On each of these was sewn a patch of worn-out tentage large enough to completely shut out the shadow.

Part of the spoil was put into sandbags for office partitions, and part was carried away in bags to be laid out irregularly between low camel-thorn bushes where sand was sprinkled over them. [It is worth noting that, in this case, the freshly dug sand was not scattered out, since the difference of texture between the excavated material and the surface sand might have shown up on an air-photograph. The bagged sand resembled stones or sand hummocks].

d. Field Works

Block-houses of heavy reinforced concrete have been found, designed to resemble the typical local North African house with a courtyard in the center. Two loopholes for machine guns were pierced low down at each corner. An anti-tank emplacement was designed to resemble a native well complete with the uprights and a pulley.

e. Tank Camouflage

Tanks have been observed in advanced areas camouflaged as trucks with steel frames and painted canvas sides, while dummy tanks made of cardboard were placed in the rear.

Groups of derelict smashed tanks have been used for covering 88-mm guns, toward which British tanks were lured by weak German tank patrols. Incidentally, tank pennants are reported to have provided excellent sighting points in the dusk for enemy gunners.

f. Minefields

A German minefield was recently camouflaged by tracks made with a spare wheel between the mines, and a British armored car was lured into it. A recent armored car patrol, which suffered a casualty on a mine reports that previous ground reconnaissance failed to locate this mine owing to the fact that the enemy had apparently made deep tracks with a spare wheel in order to conceal the presence of the mine.

Places where mines are laid may show signs of the earth having been disturbed, but owing to rain and sun, the sites may soon become sunbaked. In tracks through sand, loose pieces of scrub are placed on top of the mine as camouflage. These loose pieces of scrub may have booby traps attached to them. They are laid at very irregular spacing, but always either on or near a track. There are also dummy minefields completely wired in. These contain tins sunk into the ground with occasionally booby traps attached to them. The gaps between the dummy minefields are invariably sown with time mines.*

*A mine which has a setting that renders it inoperative after the time for which it is set has expired.

On the tar-macadam roads, the mines were well hidden by a thin layer of tarred gravel of the same texture as the road. The mines were first covered with a patch of asphalt, then loose sand or dust was scattered on top. The apparently careless half-concealment of dummy antitank mines is intended both to deceive the air camera and to induce the drivers of vehicles to drive over the carefully hidden genuine mines. In German minefields, the mines were so camouflaged that it was impossible to tell within 10 feet of where they lay--a fact confirmed by photographs on the spot.

From a recent German document, it is clear that air-photo interpreters take special note of army tracks or roads that twist and turn suddenly for no reason apparent in the nature of the ground. From such twists and turns the interpreters infer the probable existence of a minefield, and they warn their troops to avoid giving away the position of the minefield in such a manner. While there is nothing new in this ruse, it may provide a timely reminder that there is a simple, cheap and effective way of misleading the enemy as to the general plan of defense and the location of real minefields in the defended areas. Dummy tracks with these characteristic twists in association with lightly disturbed soil in plausible locations might be successful as decoys.

A British commentator complained that in the Western Desert, British minefields were not only identified by being surrounded by a barbed-wire fence, but even the location of individual mines was obvious, even by moonlight. He suggested that for each real mine placed at least two dummy mine-locations should be made by scratching up the surface of the ground.

g. German Training in Camouflage

Camouflage and concealment are given the greatest importance in all German military training. In defense, for example, it is even regarded as being preferable to use ground less favorable from a tactical point of view, if by so doing the intentions and organization of the defense become less apparent to the enemy than they would be in a more suitable defensive position.

Throughout training, special emphasis is laid on the individual aspect of concealment. It is stressed that the negligence of the individual rifleman may lead to the premature disclosure of his squad. Particular attention is therefore paid to squad training and dress.

During training, periods devoted to instruction in concealment and camouflage are usually spent teaching the use of natural materials, such as branches, rather than the use of artificial methods. An exercise has been observed in which the troops taking part were sent off individually to see how far they could go along a certain road before they were seen. The man who got the farthest was promised half a day off. Great stress was laid on realism in training. Even during an exercise, a squad leader was made to lead his squad through a ditch full of water if better concealment was obtained thereby.

h. Personal Concealment

The German steel helmet is camouflaged with leaves, grass, or whatever foliage is at hand. A rubber band is provided to hold these in position, as it is found, when a man is lying down on the ground, that his helmet reflects the light and is then the only part of him to be seen. Each soldier has a waterproof sheet, disruptively painted. Coloring of equipment and even of faces to blend in with the various types of background is encouraged.

Individual camouflage equipment which is much used by personnel of the Japanese Army consists of a body net and head net, either or both of which are used according to circumstances. The former consists of a net approximately 1 x 1 1/2 yards in size, made of a greenish-covered straw fiber cord or ordinary twine with a square mesh something under two inches in size. The head net is of a size which will allow it to fit snugly over a steel helmet or cap, and is of the same material, mesh, and color as the body net. In addition to those pieces of individual equipment, there is a net for the horses. Branches, leaves, grass, and other local vegetation are stuck into the nets.

i. German Attempts to Camouflage Cities

A huge structure was erected on the Charlottenburger Chaussee in Berlin, a broad avenue leading westward from the Tiergarten park into the heart of the area occupied by government offices, an ideal landmark for pilots. Along its entire length of 5 miles, wire netting covered with green cloth was installed. In an effort to lure British bombers away from Berlin, it is reported that the Germans have built a fake city to deceive the enemy pilots. Outside the city is a forest which has been cut through with lanes so that at night, from the air, it is apt to look like the Tiergarten. Fake roofs of cloth and paper are stretched between the trees and on the ground are low lights like those of a blacked-out city. Looking down at night, a flyer might think he was over the center of Berlin.

In their efforts to camouflage landmarks all over the city of Hamburg, the Nazis drained Binnen-Alster (a small lake near the harbor) and on it built imitation houses. Wooden bridges have been built on the Aussen-Alster Lake to simulate the well-known Lombards Bridge, which in turn, has been disguised to resemble the Jungfernsteig (a boulevard) complete even to a replica of the Alster Pavilion, Hamburg's most famous cafe.

Again, between Laufen an Neckar and Nordheim, it is reported that a large railway station, complete in every detail, was erected in a large field, about a mile and a half away from Laufen toward Nordheim. It was exceedingly realistic, and at night had dim, colored lights to represent signal boxes, signals, etc. Fires were lit to deceive the airmen after raids. It was ineffective, inasmuch as Laufen has suffered heavy air raids.

j. Decoy Town

The important Ploesti oil wells are situated on both sides of the Bucharest--

Ploesti Road, and 3 miles before reaching the last named town. The distance of the oil wells from the road is about 600 yards. In an attempt to confuse the enemy airmen as to the precise situation of the oil wells, the Roumanians are reported to have camouflaged them by erecting a new town nearby, constructed of wood and fitted with the necessary electric installations to make it appear moderately lighted at night. The dummy town was situated about 4 miles southeast of the Ploesti railway station and is of the same size as Ploesti itself.

INFANTRY

9. JAPANESE OFFENSIVE TACTICS

Japanese tactical doctrine has always stressed the superiority of the offensive. The following summary of recent Japanese offensive tactics togethe. with the specific example indicated, are taken from a British publication.

* * *

a. Envelopment

In the past envelopment in Japanese tactics has always been closely identified with attack. Attack by single or double flank envelopment is a favorite Japanese tactic. In fact, a study of Japanese offensive operations indicates that envelopment is sometimes used as if it were an end in itself. By placing bodies of troops across the enemy line of communications the Japanese attempt to compel their opponents either to attack them or withdraw, even when other types of attack would appear to promise better results.

Japanese strategy and major tactics in the offense against well-equipped forces offer the defender two alternatives--to attack the Japanese often on ground favorable to the defense, or to give up ground. In the first Burma campaign, from the time that the Japanese crossed the Salween River at Moulmein until the last action at Shwegyin on the Chindwin there are very few recorded instances of deliberate attacks. Rather was their superior mobility used to force us [the British] to attack troops who had succeeded ir. occupying a position behind us. The Japanese chose an area on the line of communication to hold which would cause us the maximum embarrassment and the focal point of the battle which ensued was often a road block. In fact, the Japanese fought defensively in country peculiarly suited to the defense. One big exception to this method during the first Burma campaign was an attack launched against one of our regiments at Kyaukse; here the Japanese suffered considerable losses and the attack failed completely.

b. Attack in Mobile Warfare

(1) Reconnaissance

Japanese attacks are preceded by careful reconnaissance in which various ruses are employed in order to discover the location and extent of enemy localities. Trees are shaken in order to draw fire, defending troops are addressed in their own language in the hope that they will respond, and small parties are used as bait for enemy fire. Finally, it cover permits, scouts may be left in observation for long periods close to the enemy main line of resistance.

(2) Methods of Attack

Attacks may take the form of single or double envelopment or frontal assaults. Zero hour is often any time from midnight to first light. Between 0300 and 0400 has recently (April 1943) been a common zero hour.

(a) The Enveloping or Flank Attack

Pressure is exerted frontally while the main effort is made around one or both flanks. Attacks of this nature often involve a double envelopment, a small flanking attack being made with an objective one to three thousand yards behind the enemy's main line of resistance, while a further turning movement is made some miles behind them. This double attack has sometimes been described as two thrusts--one made against regimental headquarters and the other against divisional headquarters.

(b) The Frontal Attack

While in Malaya and Burma we have chiefly experienced the attack by envelopment, the Americans report that in the Southwest Pacific area frontal attacks have often been made, particularly when an operation demanding more time might have given the defenders the opportunity to improve their positions.

Before a frontal attack, every effort is made by reconnaissance and ruses to locate a soft spot. Against this is directed the main effort of the attack, the object of which is to achieve a breakthrough.

Forward troops infiltrate, taking advantage of all available cover to creep forward. This is in the nature of a battle reconnaissance which goes to ground when held up by the defender's fire, but brings light machine-gun and mortar fire to bear on any positions it has discovered.

If the attack on the chosen sector does not succeed it is not uncommon for the main effort to be directed temporarily against another part of the front--the old axis of attack being reverted to later.

(3) Artillery

The artillery available for the support of a Japanese division in the attack in mobile operations has, by Western standards, so far been inadequate, and this weakness may account both for frontal attacks being launched without covering fire, and for the words "rash and costly" with which an American commentator describes them.

The field artillery so far met with in mobile warefare--and this was largely artillery from the infantry regimental gun company--was chiefly directed against our own gun positions. Such counter battery work in the Arakan has so far been inaccurate and therefore ineffective. Given sufficient data the Japs fire on large and small unit headquarters.

c. Attack Against a Fortified Position

The predominant considerations in an attack on a fortified position are surprise, preparation, and concentration. The Japanese ability to achieve surprise extends to all forms of warfare. Their preparations for an attack of this nature are extremely thorough and in the case of Hong Kong may be said to have extended over a number of years. Where possible, consular staffs, spies, and even officers and men in disguise have been employed in peacetime to make accurate and comprehensive surveys of fixed defenses and vital communications, while fifth columnists are employed for the same purpose in war. Besides the study of defenses and communications, preparation includes the accumulation of engineer equipment of suitable size to bridge probable demolitions, and the selection and training of special assault troops who have been chosen for their high intelligence.

They have been quick to profit by German methods and German experience and to realize that daring and highly-skilled assault troops will succeed where no amount of massed infantry will avail.

The operation frequently begins with heavy air attacks on airfields, antiaircraft gun positions and headquarters. Later high-level and dive-bombing attacks are directed against fortifications.

A heavy preponderance of artillery is employed and mobile medium artillery (105 mm) firing armor-piercing shells is used against splinter-proof shelters.

The technique of the assault is ably described by an officer who was in the battle of Hong Kong:

"Numbers of assault troops would infiltrate through our lines under cover of darkness, and would hide in trees and bushes whence they would snipe our troops from the rear.

"The position to be attacked would be subjected to very heavy dive-bombing and artillery fire during the day.

"Assault troops in parties of ten would stalk the position, making such good use of ground and cover that they were rarely seen. The position, meanwhile, would be subjected to intense mortar fire, and fire from 50-caliber machine guns to penetrate the iron doors and windows of concrete shelters and pillboxes.

"When all parties of assault troops were in position in the dark, the mortar fire would suddenly increase. Then the parties of assault troops would make a coordinated assault on the position, throwing hand grenades and firing light machine guns, and at the same time receiving supporting fire from light automatic weapons and machine guns.

"If our troops took cover in their concrete shelters, the storm troops would surround the position, and approaching from the rear would drop hand grenades down the air vents of the shelters, killing the garrison; anyone trying to escape from a shelter, was picked off by someone waiting with a light machine gun to receive him."

d. Example of Offensive Tactics in the Arakan

Early in February 1943 the Japanese were on the defensive in the Arakan sector on the west coast of Burma roughly west of Mandalay. They had withdrawn from the line Buthedaung--Maungdaw, and were occupying positions along the general line Myohaung--Rathedaung--Donbaik (see figure 1). In the Kaladan Valley the opposing forces were not in contact with each other.

During the early hours of 21 February, a Japanese force estimated at between 200 and 300, advancing from the East, attacked our small post at Kaladan, the garrison of which withdrew to Paletwa (15 miles north of Kaladan). The enemy at once set about putting Kaladan in a state of defense with the apparent intention of holding any force which attempted to advance southwards down the valley.

During the second half of February a steady increase in the garrison at Myohaung was reported and towards the end of the month the Japanese who had previously been singularly inactive in the Rathedaung area began to infiltrate around our left flank by way of the foothills northeast of Rathedaung.

On 6 March enemy forces attacked our detachments in the Apaukwa--Kanzauk area. Our troops, an infantry battalion and some gunners, were forced to withdraw northwards up the Pi Valley, during the night of 8 and 9 March and the days following.

By now pressure was increasing on the left and right flanks of our force before Rathedaung and by the 12th, when considerable enemy forces from the Kaladan had begun to debouch from the hills into the Mayu River valley, heavy fighting developed east and southeast of Htizwe, the enemy being described by one

observer as "coming on in droves." One company of the 1st Punjab Regiment was attacked six times in four and a half hours but held its ground, inflicting heavy casualties upon the enemy.

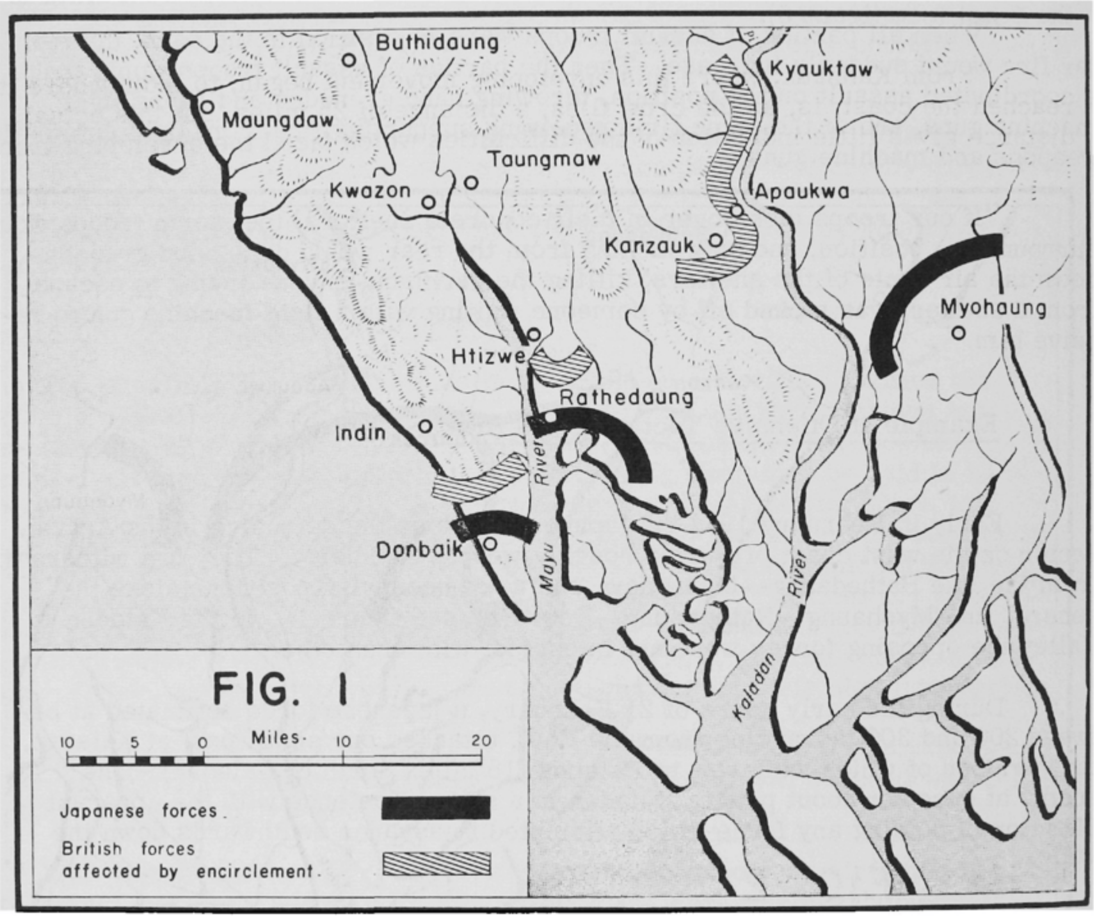


FIG. 1

Before descending into the plain the Kaladan force was joined by a battalion from the Tawbya. The combined force fanned out on reaching the plain, not only cutting the line of communications of our force north of Rathedaung but also advancing up the east bank of the Mayu River towards Taungmaw (see figure 2).

On the night of March 16-17 our forces, no longer possessing a line of communications, broke contact with the enemy and withdrew northwards through a covering force.

The enemy opposite Taungmaw appeared to be in the nature of a holding force similar to that established at Kaladan. The main thrust was continued westward across the Mayu and by March 25 infiltration into the Mayu Range had already begun.

At midnight on the 2d and 3d April a party of Japanese suddenly attacked and overwhelmed a standing patrol on a bridge northeast of Indin; they were unable to establish a successful road block but the threat to our communications here and further north was such, that we were forced to withdraw our forces northwards up the coast (see figure 3).

From Kanzauk, where this enveloping movement began, to Indin where it reached the coast, is, as the crow flies, a distance of 25 miles, but this actual distance gives little indication of the difficulties which faced the enveloping troops

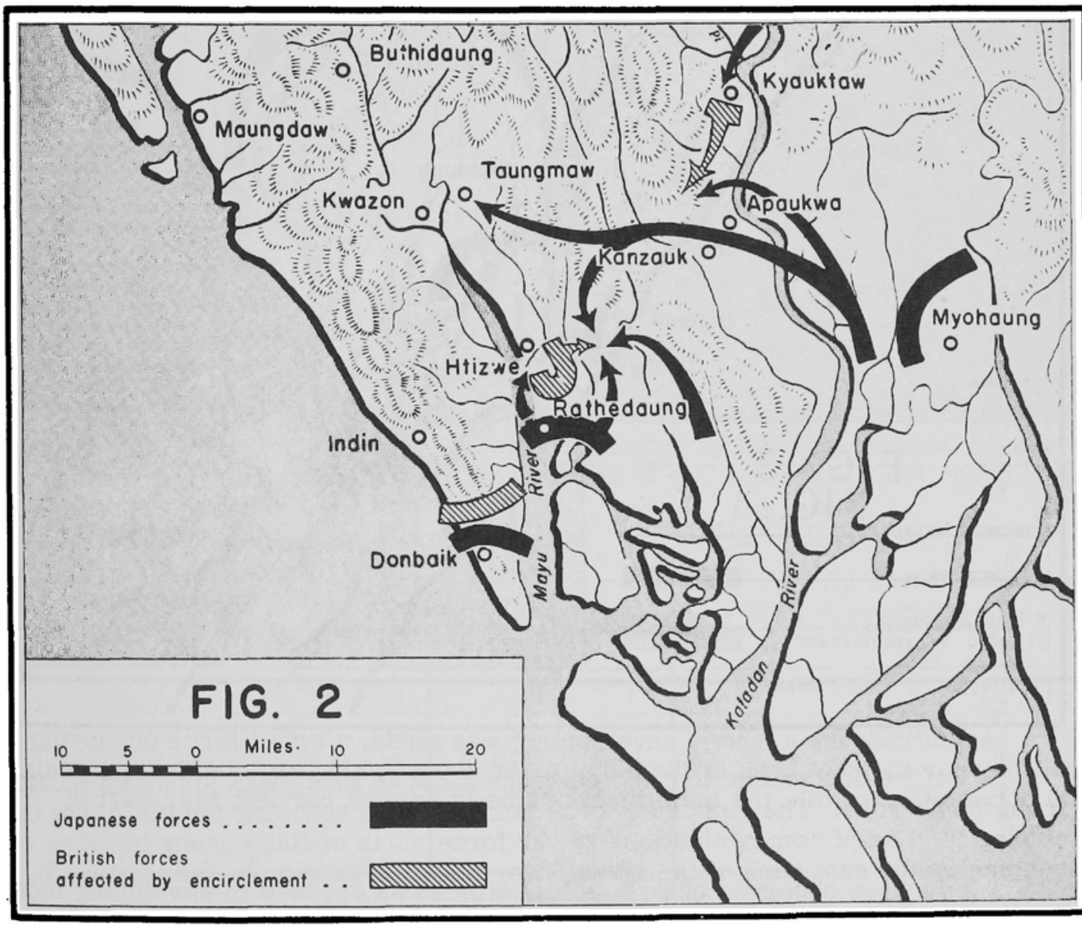


FIG. 2

Except for small paths running east and west through the hill areas all lines of communication run north and south, and until such time as British forces in the Rathedaung area were forced to withdraw, the enemy depended to a large extent for supply on what they carried with them. Later, supply was based on the Mayu River valley but here also it was not too easy, for the British air force and Burmese gunboats continued to patrol the river. As the forces involved in the operation increased, so did the problem of supply.

[redacted]

The operation was typical of Japanese offensive tactics: although the maneuver gradually extended right across our front--or rather rear--few direct attacks took place after the battle around Htizwe. A part of the enveloping force occupied a position around Indin and waited to be attacked, while other elements continued infiltration northwards through the hills.

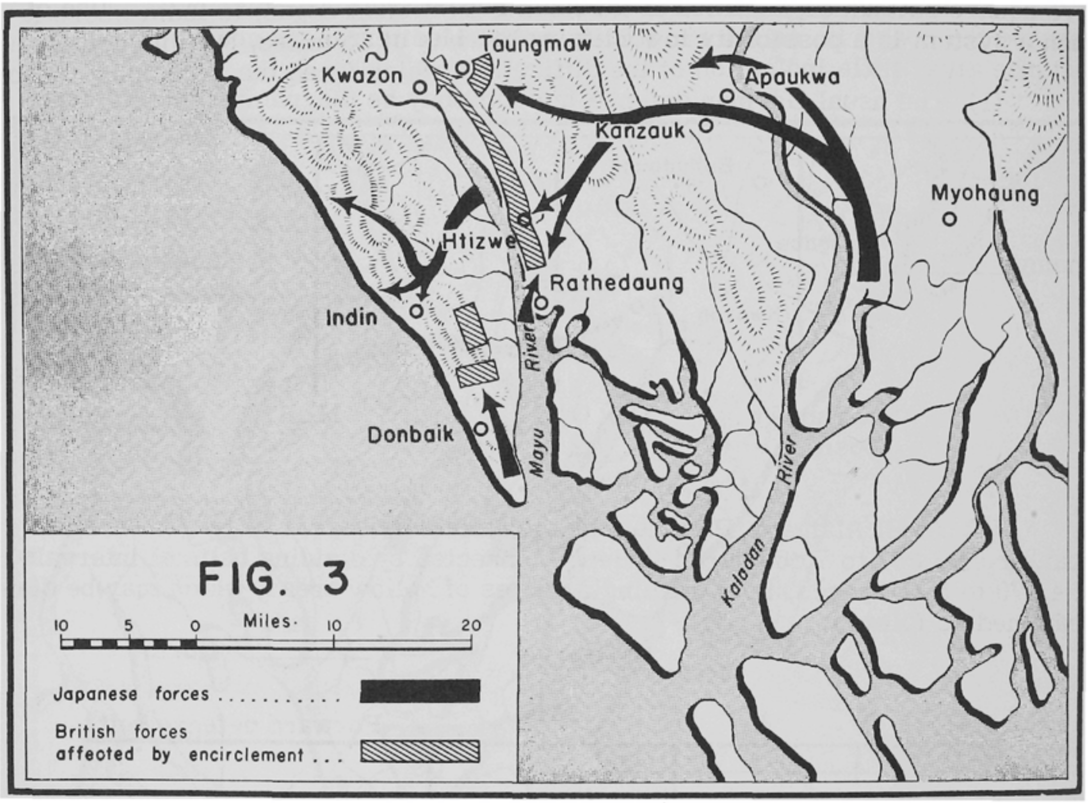


FIG. 3

At Rathedaung a double envelopment was made, a small force occupying a position near the east bank of the Mayu river about 3,000 yards behind our main line of resistance while the main thrust came in against our left rear, east of Htizwe.

As we have observed before, actual attacks as opposed to enveloping movements were made with great determination but they lacked preparation and careful coordination. As a result they were very costly and it is estimated that by the time they reached Indin battalions averaged only 450 strong. (The battalions used in this operation contained only 3 companies and had a full strength of about 750).

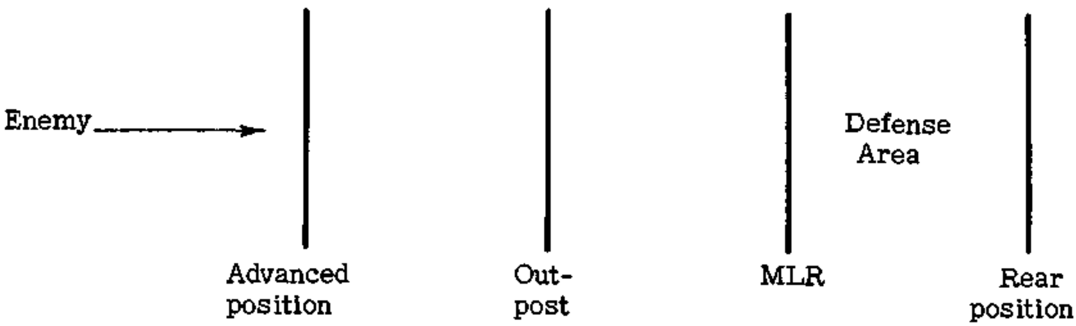
In conclusion it remains only to be said that once again the Japanese had, where possible, avoided attack as a means of achieving their object using their superior mobility to occupy a position on our line of communications where we should be compelled to attack them or withdraw.

10. ROMMEL'S DEFENSES OF STABILIZED POSITION AT EL ALAMEIN

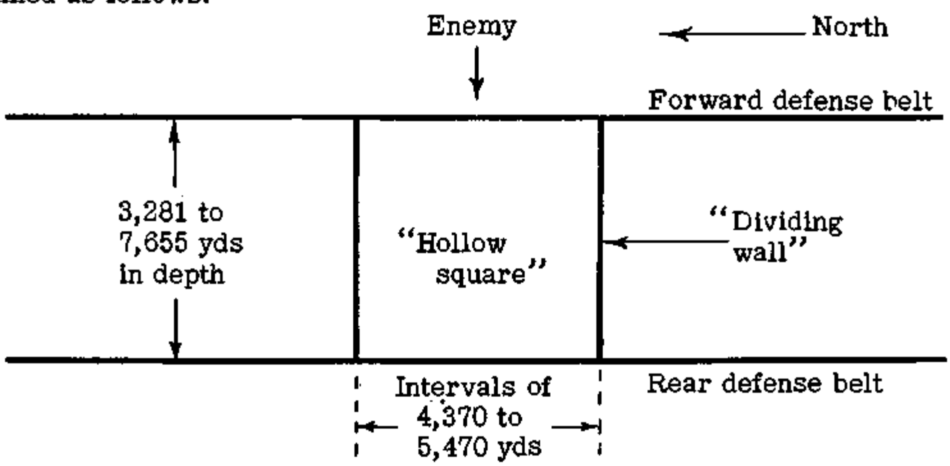
A well-organized defense capable of quickly and effectively reverting to the attack, with cunning and deception concealing movements and dispositions, can sometimes offset numerical superiority.

Due to the great length of front and shortage of troops at El Alamein, Rommel modified the traditional German system of defense in depth to a defensive square pattern as revealed in a recent report from Allied sources. Use of such a system is a possibility in fortifying the Mediterranean coast line.

(1) The usual German defense in depth may be diagrammed as follows:



(2) At El Alamein, Rommel used two main defensive belts (forward and rear) from 3,281 to 7,655 yards in depth connected by dividing belts at intervals of 4,370 to 5,470 yards, thus forming a series of hollow areas, which may be diagrammed as follows:



(3) The "hollow squares" formed by such a defensive pattern are characterized as follows:

(a) Designed on topographical basis with artillery placed so as to cover entire area:

[redacted]

(b) Act as traps for troops who succeed in penetrating forward defenses;
(c) Permit enfilade fire from either or both of "dividing walls" and rear position;
(d) Artillery disposed for defensive fire throughout front with particular concentration on the "hollow squares."
(e) Minefields give additional protection in these "hollows", which were called "devils gardens" by Rommel.

(4) The forward defense belt, thinly manned, was protected by minefields and listening posts. These were for prevention of surprise and deception rather than defense.

(5) Main advantages of such a defense are:

(a) Permits covering of wide front with a minimum number of men;
(b) Protects troops from hostile artillery fire which is usually concentrated on forward defense belt.

ORDNANCE

11. GERMAN ANTICONCRETE SHELLS--150- AND 210-MM CALIBERS

Reference was made in Tactical and Technical Trends, No. 18, p. 23, to the special German design of shells for the destruction of concrete. These designs are thought to be initiated recently.

In the description which follows details are given about the weight and filling of the 150- (5.9 in) and 210-mm (8.3 in) calibers of this shell. The accompanying sketch shows the method of filling in each case.

Both shells have a base fuzed piercing shell, the smaller shell fired by the 150-mm medium howitzer (15-cm s.F.H. 18*), and the larger by the 210-mm heavy (21-cm Mörser 18). A steel exploder container is fitted to these shells with a ballistic cap welded to the shell.

a. Shell Filling for 150-MM

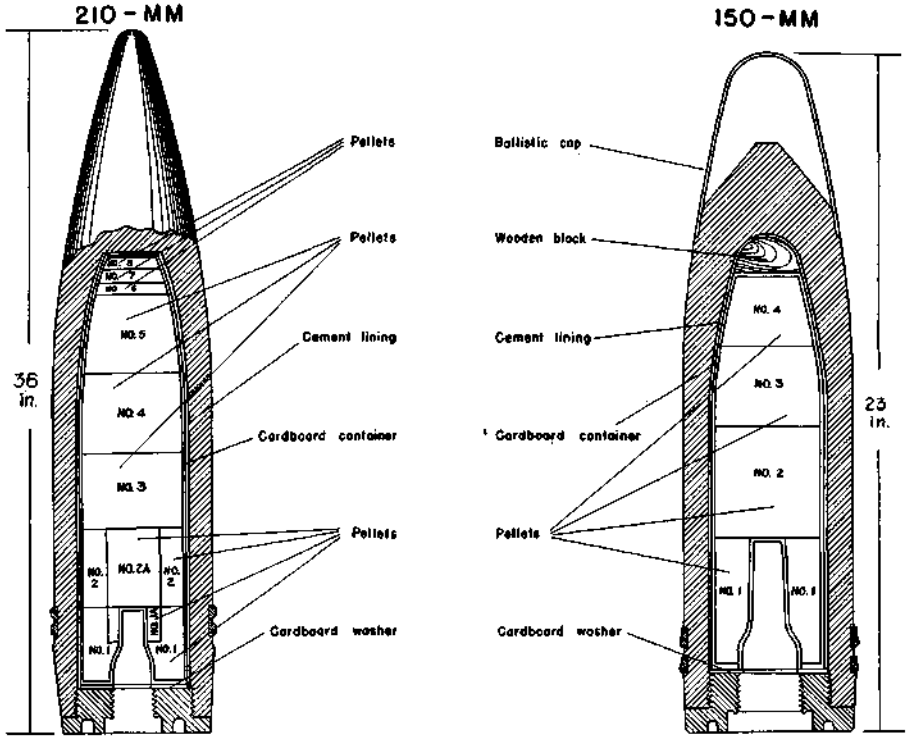
Four pressed pellets comprise the shell filling. These are placed in a container with a wooden block at the nose. The complete charge is held in position in the shell by a cement lining. The filling consists of TNT around and in front of the exploder container, and of waxed TNT towards the nose. The gaine exploder container is of the C/98 type filled with picric acid.

b. Shell Filling for 210-MM

Ten pressed pellets comprise the shell filling. They are placed in a card-

*schwere Feldhaubitze--medium field howitzer.

board container which is held in position by a cement lining. The shell filling is interesting in that it has 3 flat disk pellets at the nose. The front one is pressed potassium chloride, and the two immediately to the rear are a mixture of TNT,



GERMAN ANTICONCRETE SHELL

wax, and potassium chloride. They are apparently intended to provide a deadened HE filling in the nose of the shell. Another feature of interest is that the straight TNT portion of the filling, which picks up a detonative impulse from the exploder, is completely surrounded by waxed TNT.

Additional details for each shell follow:

150-MM

Weight (filled)	95 lb 5 oz
Weight (empty)	83 lb 8 oz
No. of pellets	4 (total weight 7 lb 2 oz)
Weight of Pellets,	
No. 1	2 lb 2 oz (TNT)
2	2 lb 6 1/2 oz (TNT)
3	1 lb 10 1/2 oz (TNT/wax 95/5)
4	15 oz (TNT/wax 90/10)

[redacted]

210-MM

Weight (filled)	267 lb 12 oz
Weight (empty)	237 lb 3 oz
No. of pellets	10 (total weight 25 lb 8 3/4 oz)
Weight of Pellets,	
No. 1	4 lb 2 oz (TNT/wax 94/6)
1a	8 oz (TNT)
2	4 lb 3/4 oz (TNT/wax 90/10)
2a	1 lb 5 1/2 oz (TNT)

No. 3	5 lb 2 oz (TNT/wax 90/10)	6	6 oz (TNT 60.5, wax 5.4 potassium chloride 34.1)
4	5 lb 4 1/2 oz (TNT/wax 91/9)	7	5 oz (TNT 44.1, wax 5.6 potassium chloride 50.3)
5	4 lb 2 oz (TNT/wax 91/9)	8	5 oz (potassium chloride)

12. COMPARISON OF GERMAN MACHINE GUNS

The following comparison and photographs of the German machine-gun model 34, 34 (modified), 34S, 34/41 and 42 are based on data received from the Aberdeen Proving Grounds.

The MG 34 is a familiar weapon, and model 42 has already been described in Tactical and Technical Trends no. 20, p. 28 and no. 31, p. 37. This report is of interest because of its comparison of the variations of model 34 and the excellence of the detail of the illustrations.

* * *

a. MG 34 Modified

The MG 34 (modified) is used principally in armored vehicle hull mounts and differs from the MG 34 in the following:

(1) Heavier barrel jacket adapted to fit in ball type hull mounts
(2) Absence of antiaircraft sight bracket
(3) Simplified and easily operated firing pin nut lock
(4) Bipod clamps for attaching bipod for emergency use.

This model can be mounted on the antiaircraft and heavy ground mounts.

[redacted]

b. MG 34S and 34/41

The MG 34S and MG 34/41, are identical in appearance except for the perforated operating handle of the MG 34/41 (see figure 2) but are named in this report separately only because a definite effort was made to make them as distinct models. The reason for this is unknown. One description will suffice for both weapons. They differ from the MG 34 in the following:

(1) Provision for full automatic fire only instead of full or semiautomatic fire;
(2) Simplified trigger group with extensive use of stampings;
(3) Barrel 3 1/2 shorter with enlarged muzzle end to accelerate recoil;
(4) Simplified bolt and bolt-locking sleeve eliminating many machining operations;
(5) Elimination of firing pin lock nut and substitution of a simple, easily operated, plunger type, catch recessed in the bolt carrier;
(6) Larger and stronger ejector assembly located in the left receiver wall;
(7) Larger and stronger buffer group;
(8) Heavier recoil spring constructed of two lengths of woven wire;
(9) Addition of a cocking lever catch to secure cocking lever in the forward position;
(10) Modified feed mechanism providing a more secure trip on the cartridge.

Both models can be used on the antiaircraft mount and although they appear to have been designed for mounting on the heavy ground mount, the clamp, fitting over the rear end of the barrel jacket cannot be secured when the gun is in place. A different trigger actuator is also required. The MG 34 and the models described above may be mounted flexibly in tank hulls.

c. MG 42

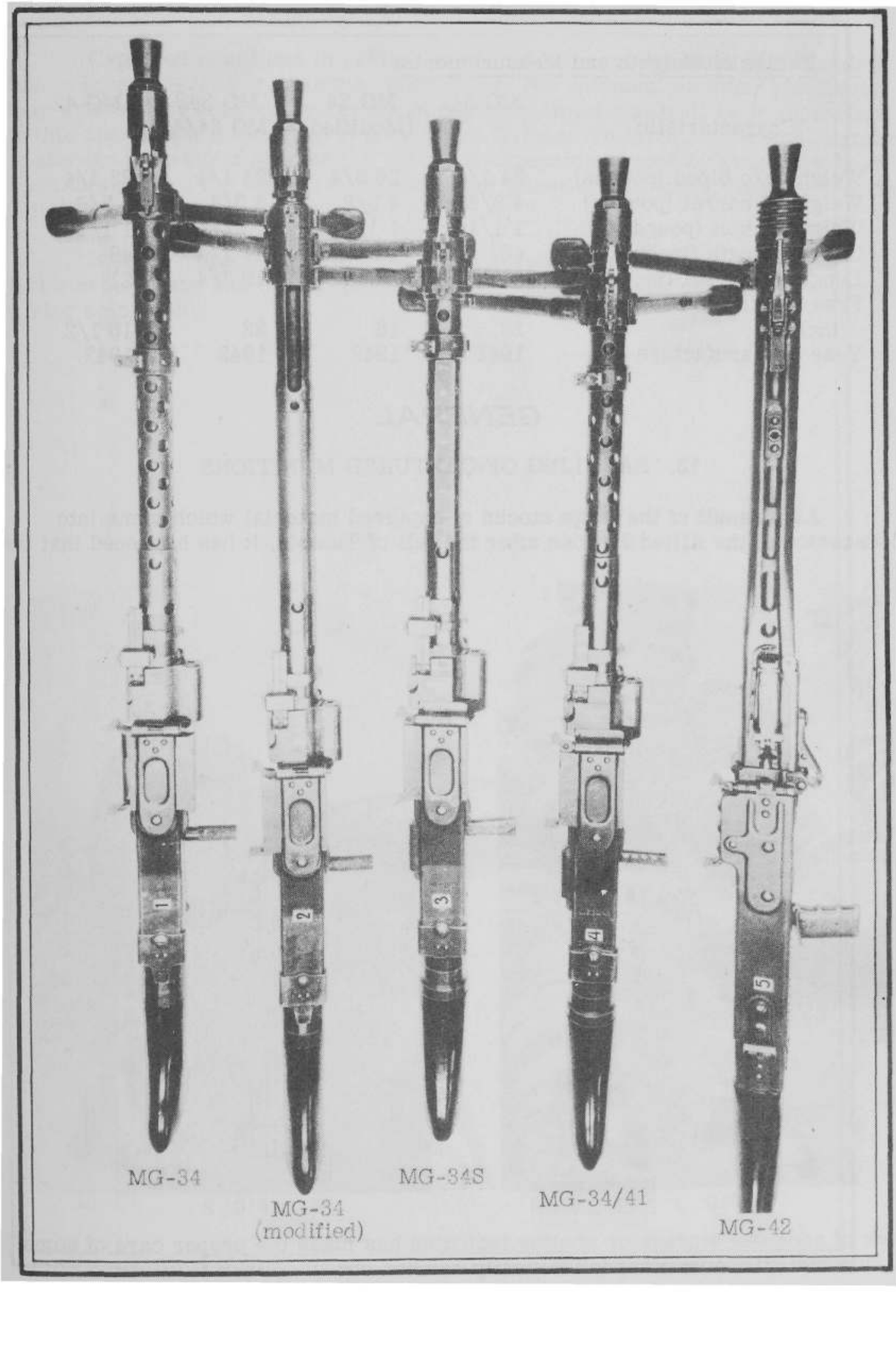
The MG 42 is a new design but has the same tactical employment. A few of the outstanding characteristics will be listed here. The MG 42 differs from the MG 43 basically in the following:

(1) Extensive use of stampings in receiver, barrel jacket, cover assembly, and trigger group;
(2) Provision for full automatic fire only;
(3) Simplified bolt assembly allowing rollers to lock bolt to locking sleeve and eliminating locking lugs. The bolt carrier is a forging;
(4) Simplified buffer mechanism with a very heavy spring;
(5) A new and simplified quick change barrel is provided;
(6) A more flexible feed mechanism is provided making for smoother operation.

Bipod, antiaircraft and heavy ground mount are provided but these mounts are not interchangeable with those used with the MG 34.

COMPARISON OF GERMAN MACHINE GUNS

MG-34 | MG-34 (modified) | MG-34S | MG-34/41 | MG-42


MG-34
MG-34 (modified)
MG-34S
MG-34/41
MG-42
1
2
3
4
5

[redacted]

d. Tables of Weights and Measurements:

Characteristic	MG 34	MG 34 (Modified)	MG 34S MG 34/41	MG 42
Weight w/o bipod (pounds)	24 1/2	26 3/4	24 1/4	23 1/4
Weight of barrel (pounds)	4 3/8	4 3/8	3 3/4	3 7/8
Weight of bolt (pounds)	1 1/16	1 1/16	1 5/16	1 1/16
Overall length (inches)	48	48	44 1/4	48
Length of barrel (inches)	23 1/2	23 1/2	19 3/4	21
Free length of recoil spring (inches)	18	18	22	15 1/2
Year of manufacture	1941	1942	1942	1942

GENERAL

13. HANDLING OF CAPTURED MUNITIONS

As a result of the large stocks of captured material which came into possession of the Allied Nations after the fall of Tunisia, it has happened that the

FIG. 1

FIG. 2

lack of adequate storage or shelter facilities has made the proper care of some of this material somewhat indifferently carried out.

[redacted]

Captured munitions in particular should be carefully handled if accidents are to be avoided. For example, when stored for shipment or other purposes, they must not be exposed to excessive heat nor direct sunlight, as in figure 1. In this connection it has been reported that German Tellermines when so exposed in storage have burst open as the result of expansion caused by excessive heat; when this occurs the explosive fillers of the mines are exposed, thereby creating a dangerous hazard (see figure 2).

If proper precautions are not taken accidental explosions will occur; in fact a recent case has been reported where a number of German mines exploded during shipment.

[redacted]

SECTION II

[redacted]

GERMAN SMOKE TACTICS FOR SUPPORT OF COMBAT TROOPS

"The fire power of modern automatic weapons is so great that it is almost impossible for infantry to advance across open terrain without prohibitive losses, unless the advance is preceded by an intense artillery preparation, or is screened with smoke. It will usually be desirable to use a combination of methods; artillery, mortar fire and flame throwers to disrupt the enemy plan of fire, and smoke to screen the friendly operations.

"The use of smoke to screen infantry operations came into extensive use during the First World War. Its value is now so well recognized that no attack of importance can be undertaken without first considering the possibilities for its employment."*

The significance of this quotation is highlighted by the fact that the Germans have made extensive and effective use of smoke for support of ground combat operations and may be expected to continue to do so. For this reason, German tactics in the use of smoke is important. These tactics are set forth in a chapter of a German handbook written by General Friedrich von Cochenhausen and entitled "Tactical Handbook for the Troop Commander". While this is not an official German military manual, it is thought to be authoritative in that it is known to have been extensively used as late as 1942 by German army personnel, especially officer candidates and junior officers, and there is no reason to suppose that it is not similarly used today. Although the translation is extracted from the 1940 edition of this handbook, it is nevertheless believed to embody current German thought on the subjects treated.

Before going further, a brief description of the organization of German "smoke troops" (Nebeltruppen) should be given. In this connection it must first be pointed out that, as far as is known, the German army does not have a chemical warfare service as such. However, it is believed that these smoke troops are general chemical warfare troops, who are trained for both smoke and gas operations, and in the event of chemical warfare breaking out, the offensive role will be borne primarily by them. Specifically with reference to the use of smoke, it should be borne in mind that when smoke is required in limited areas it is produced generally by smoke-producing ammunition fired by the combat units' organic weapons, such as artillery and mortars; in operations involving the use of smoke in large quantities the specially trained and equipped smoke troops are used.

The German smoke troops are a separate arm of the service, under an "Inspectorate of Smoke Troops and Gas Defense", which is concerned with the offensive use of gas, and gas defense. Smoke units are organized in general on artillery lines, in regiments, battalions, and batteries. The smoke regiment consists of a headquarters company, a signal platoon and three smoke battalions. The battalion contains a headquarters platoon, a signal platoon and three batteries. Each battery consists of two platoons, each with three 105-mm (4.14 in) mortars. The total armament of the normal regiment is thus 54 smoke mortars. Batteries

*Quoted from "Chemical Warfare Intelligence Bulletin No. 15", dated 1 June 1943 and published by the office of the Chief of Chemical Warfare.

of 8 mortars are known, thus a regiment may have as many as 72 mortars.

Great importance is attached by the Germans to the primary role of the smoke troops, which are GHQ units and normally allotted to corps as required, for purely smoke purposes. In any large scale operation smoke will be fired by smoke and artillery troops, under the control of an artillery commander.

The basic weapon, as noted above is the 105-mm mortar.

The following smoke units have been reported:

(1) Eight smoke regiments, including one SS regiment, in the GHQ pool.
(2) Three heavy smoke regiments equipped with rocket weapons.
(3) Ten independent smoke battalions.
(4) Two experimental smoke regiments.
(5) A mountain smoke battalion.

A number of these units have been reported destroyed at Stalingrad. Three smoke batteries have also been reported in North Africa.

It is now known that the Grossdeutschland Division and probably 20 divisions formed since December 1941, include an organic smoke battery.

It is well to point out here that the Germans distinguish between the blinding screen and the area screen, a distinction not specifically made by General von Cochenhausen. The blinding screen is laid to blind hostile observation. The area screen is laid over an extensive area and fighting is carried out within the screen under conditions similar to a natural thick fog. For details on the tactics involved in the use of an area screen see Tactical and Technical Trends, No. 18, p. 39.

The translation from General von Cochenhausen's handbook follows

* * *

EMPLOYMENT OF SMOKE (ARTIFICIAL FOG) IN COOPERATION WITH COMBAT TROOPS

a. Purpose and Characteristics of Smoke (Artificial Fog)

Smoke is used to conceal friendly troops and installations; to blind or deceive the enemy or to hinder the effect of his fire. Smoke is also used to cover the enemy. Or, in case it is desired to cut out hostile observation, it may be used to cover friendly troops. It is preferable to smoke the enemy if the smoke mission in the given situation can be accomplished with the available material. The enemy's fire effect is decreased if the smoke covers his riflemen and observation posts

rather than his targets. To smoke friendly troops will restrict their action and draw the enemy's attention toward them.

Although slightly irritating, smoke is harmless. Being practically the same color as natural fog, it is distinguished by its greater density and sharper outline, as well as its sudden rise and disappearance. Its density and extension depend upon weather and terrain.

Favorable conditions for the employment of smoke are: a steady moderate wind; humid atmosphere; clouded sky; falling temperature; early morning or late evening hours; bare, even terrain.

Unfavorable conditions for the employment of smoke are: a calm, very weak or very strong gusty wind, constantly changing its direction; dry atmosphere; sunshine; heat; hilly or covered terrain.

b. <u>Smoke Materiel</u>

(1) <u>Smoke Shell</u>

Smoke may be produced by special ammunition for artillery and mortars, as well as ammunition for similar special weapons of foreign countries (for example, the American 107-mm gas mortar, having a 2,250-meter range*). Smoke shell is most applicable for use against hostile troops and it is least dependent upon the weather. For the relation between the point of impact and the target with respect to different wind directions, see figure 1. A smoke cloud which is to blind the enemy should be built up as rapidly as possible and maintained with moderate fire.

Ordinary mortars and special gas mortars normally consume less ammunition than guns of equal caliber. For example, the American gas mortar requires a maximum of only four rounds per minute to build up and maintain a smoke cloud 200 meters wide.

(2) <u>Smoke Sprayers and Smoke Releasing Apparatus</u>

Devices which squirt out a smoke-producing fluid may be used to establish a smoke curtain (see figure 2) or a smoke cloud (see figure 3).

The types of sprayers most commonly used are the small sprayer carried on the back of the individual soldier, and the large sprayer which is moved into position on a hand cart. The small sprayers produce smoke for a period lasting about 10 minutes, and the large ones, for periods lasting from 30 to 40 minutes. The small sprayers can be used by troops while they are in movement, or in position. These sprayers are suitable for rapid use within the combat area of infantry troops. The installation of the large sprayers in the foremost parts of the combat zone is

*This and other references to U.S. materiel are part of the original German document.

time consuming, and possible only when the terrain is hidden from hostile observation.

Italy and Russia possess vehicles which release smoke during periods lasting from 60 to 70 minutes. These vehicles are used generally while in motion

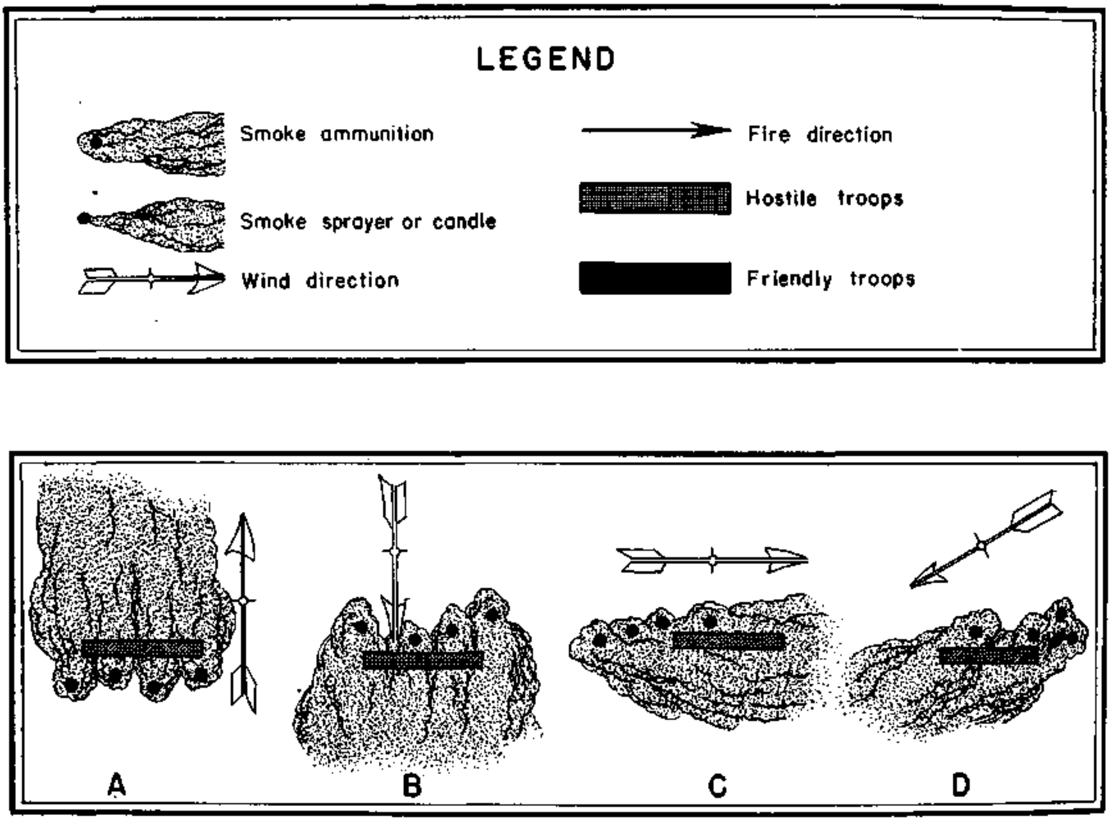


FIG. I

to conceal the movements of large units of mixed forces or to conceal motorized troops.

Sprayers may release smoke effectively, irrespective of the direction and speed of the wind. Unarmored and armored vehicles equipped with sprayers may release smoke effectively even in a calm atmosphere, providing the vehicles are moving at high speeds. However, if the wind is blowing away from the enemy, such a method should not be used to smoke friendly front line troops. Nevertheless, this method is applicable for smoking the enemy only for short distances (seldom more than 800 to 1,000 meters), if there is a steady following wind blowing toward the enemy.

(3) Smoke Hand and Rifle Grenades

These have a limited effect both as to time and space.

(4) Smoke Candles and Smouldering Material

These develop smoke which resembles fog. The material most commonly used includes small candles that are thrown, or placed, a few paces apart on the

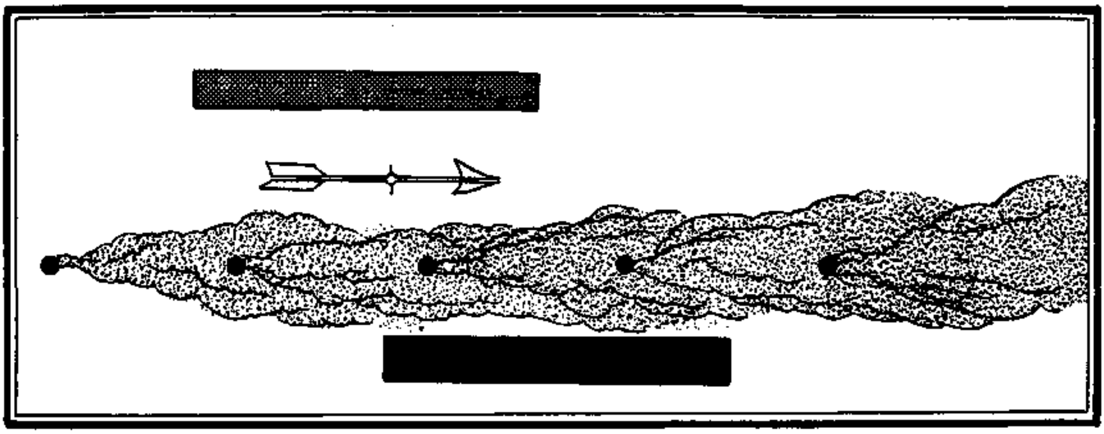


FIG. 2

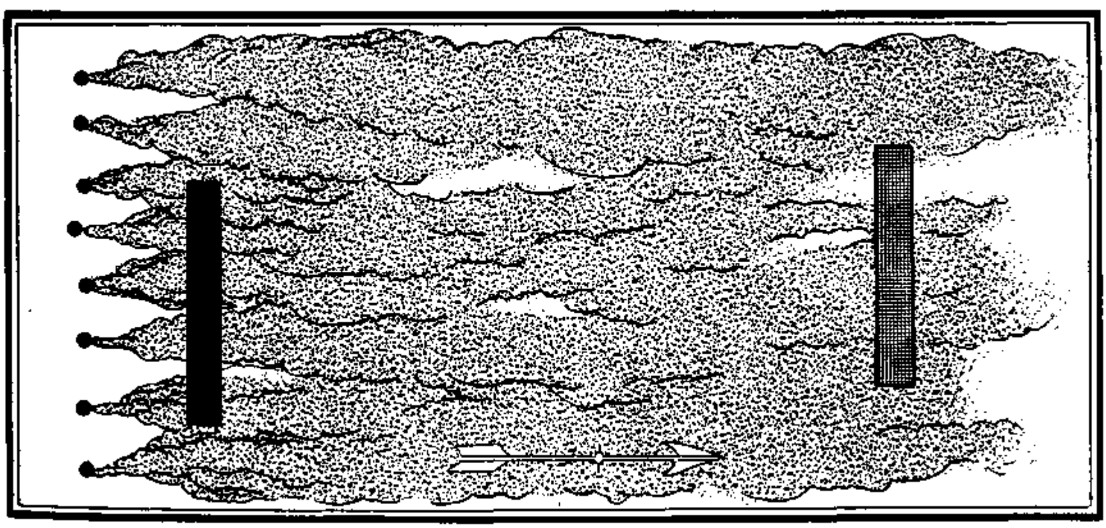


FIG. 3

ground. They produce smoke for periods lasting about two minutes, and they are used mostly in such small-scale smoke operations as in combat in the interior of the hostile position. The French infantry is equipped with a smoke candle which

weighs 15 kilograms (33 pounds) and burns about 10 minutes. These candles are used also in large-scale smoke operations.

(5) Airplane Smoke Material

Airplanes may drop smoke bombs to cover or screen the enemy for a short time in limited areas.

Airplanes may also be equipped with smoke sprayers, which, depending upon the type and size of the apparatus, can either lay a flat smoke screen about 300 meters wide and several kilometers long, or establish a vertical curtain about 200 meters high. Planes so equipped may be used to produce smoke in aerial combat, or they may release smoke to blind antiaircraft weapons or deprive the enemy of ground observation over friendly troops. Due to the rapidity with which they can be laid, and great extent but short duration, such smoke screens are suitable, principally to conceal the movement of cavalry and motorized units. According to the American opinion, these screens are unsuitable for concealing infantry. However, according to the Swedish viewpoint, they are practical even for concealing infantry, providing there is a slowly moving wind and a damp atmosphere.

c. Issuance of Orders for the Employment of Smoke

The influence of weather conditions and the usually short duration of the smoke effect, require rapid and determined action in the employment of smoke. The following disadvantages should be taken into consideration in making decisions to use it: restriction of observation; interference with neighboring troops and with the operations of weapons. Troops, especially artillery, that will be effected by the smoke should be informed of its contemplated use.

Independent employment is permitted only in case the effect of the smoke is limited to the area of the command using it. In other cases, the use of smoke is regulated by the common higher commander. The commander can withhold from his subordinate units the permission to use smoke. Only armored vehicles may use smoke without restriction for self-protection.

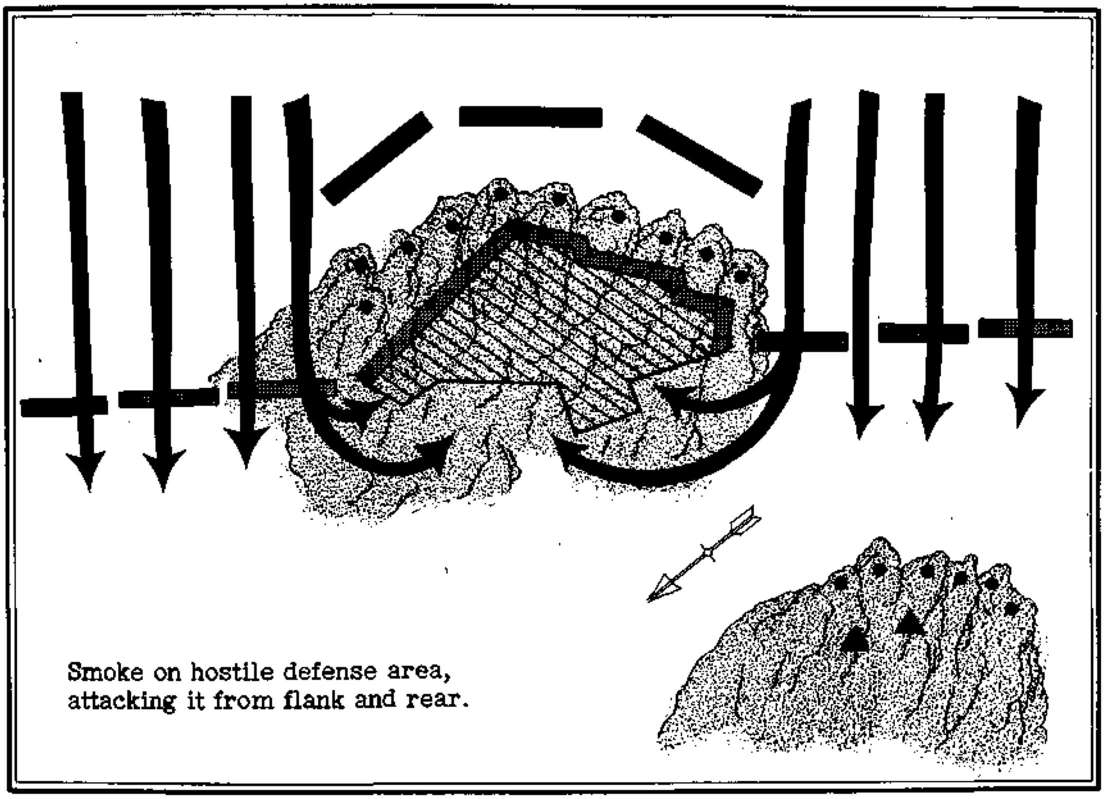
For large-scale smoke operations, army and corps commanders allot to their subordinate units, smoke troops with projectors or sprayers, the required ammunition for artillery and mortars, as well as airplanes equipped with smoke-producing apparatus. In general, the division commander regulates the use of smoke and coordinates its effect with the fire and movement of his subordinate units. Pertinent proposals in this respect are made by the smoke troop commander. The combat order should prescribe what the smoke is to conceal and for what purpose it is to be used. When used against hostile observation, the direction and duration of the screen should also be stated. To insure close cooperation, smoke troops usually are attached to the units that are to be protected.

[redacted] [redacted]

d. Use of Smoke in Large-Scale Operations

(1) Attack

Smoke conceals the movements made in preparation for attack and it facilitates surprise. Smoke reduces losses and its use is especially valuable in



Smoke on hostile defense area, attacking it from flank and rear.

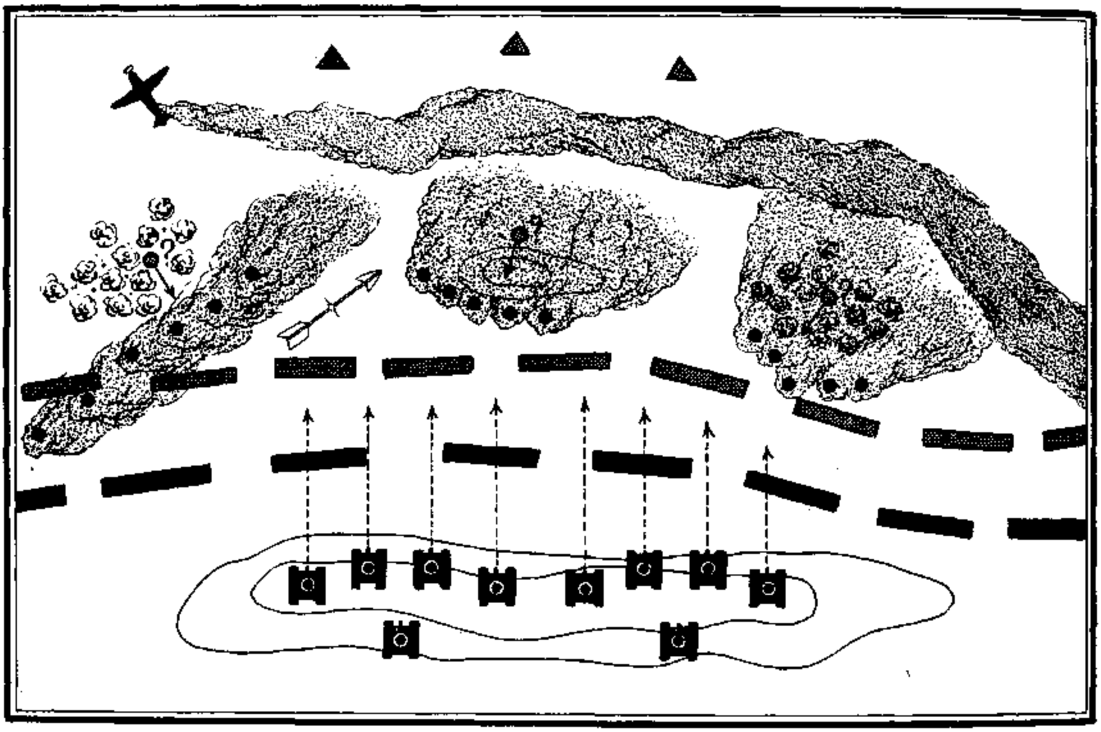
FIG. 4

crossing open terrain, and during the initial crossing of a river in the face of the enemy. Unobservable hostile positions, suspected observation posts, and defensive weapons such as concealed machine guns, can be prevented from operating efficiently by the use of smoke. Smoke troops so employed reduce the required fire power and facilitate the establishment of the artillery main effort. According to American opinion, attacking troops concealed by smoke may even forego fire protection.

Smoke serves to support the attack in the zone of the main effort, to veil weakness in adjacent zones, to disguise gaps in the line in front of thinned-out positions. Most frequently, however, the attacker uses fire from smoke-producing

[redacted]

ammunition to blind the enemy; smoke sprayers are seldom used for this purpose, and then only as a temporary expedient when the wind is blowing toward the enemy. Sprayers are mainly used to screen friendly attacking troops in order to conceal their approach, their position of readiness, the filling-in of the foremost lines, and similar movements. For illustrative examples see figures 4, 5, and 6.



Hostile OPs and suspected defense weapons smoked during a tank attack.

FIG. 5

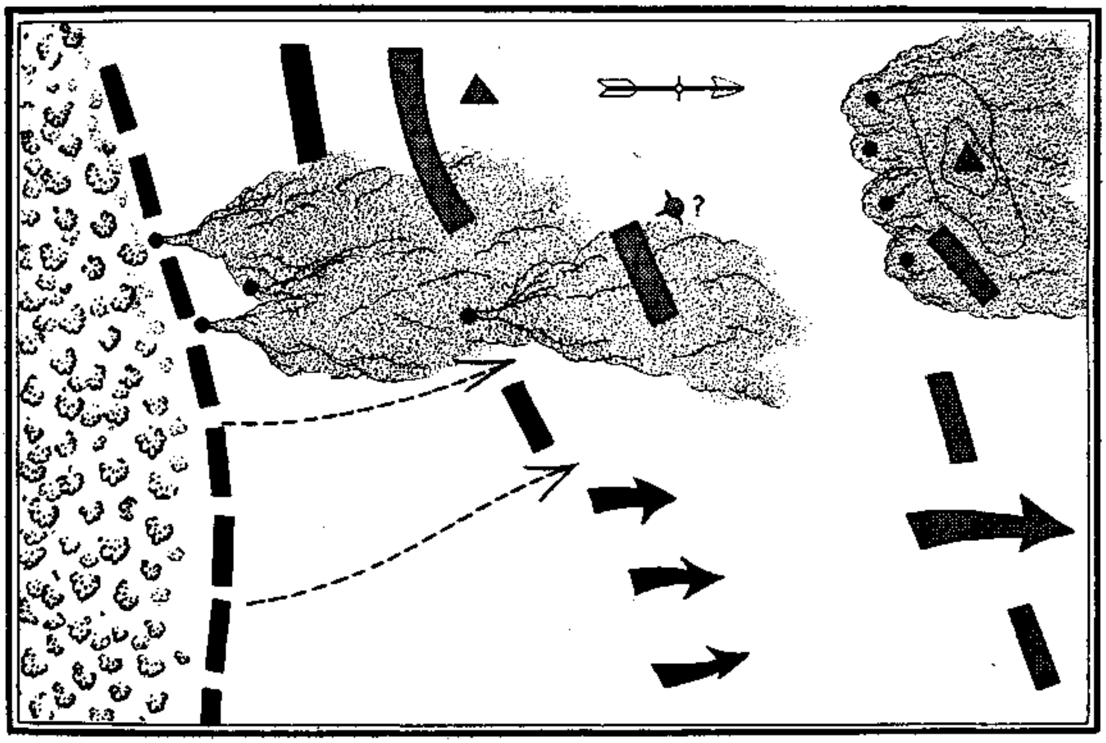
(2) Defense

In defense, the use of smoke in front of artillery observation posts is seldom advisable, because such use blinds their observation, thereby weakening the fire.

The defender's use of smoke on critical parts of his own position in case of a hostile tank attack is recommended only by the French. Such use is regarded by other countries as disadvantageous.

Fire from smoke-producing ammunition is a suitable expedient for blinding hostile observation positions. The defender should make prior preparations, if he intends to use smoke in the forward parts of his combat zone, in order to conceal working parties or other movements from hostile observation. Smoke also furnishes protection for such operations against surprise advances by the enemy. Smoke may be used in the rear of the defender's artillery observation posts, except when the wind is blowing in the direction of the observation post itself.

Such uses serve to conceal the shifting of strength (such as the movement of reserves, changes in artillery positions), but it will fulfill its purpose only if it completely excludes all ground and air observation. In a delaying action, smoke facilitates disengagement from the enemy.



Smoke protecting an attacking flank.

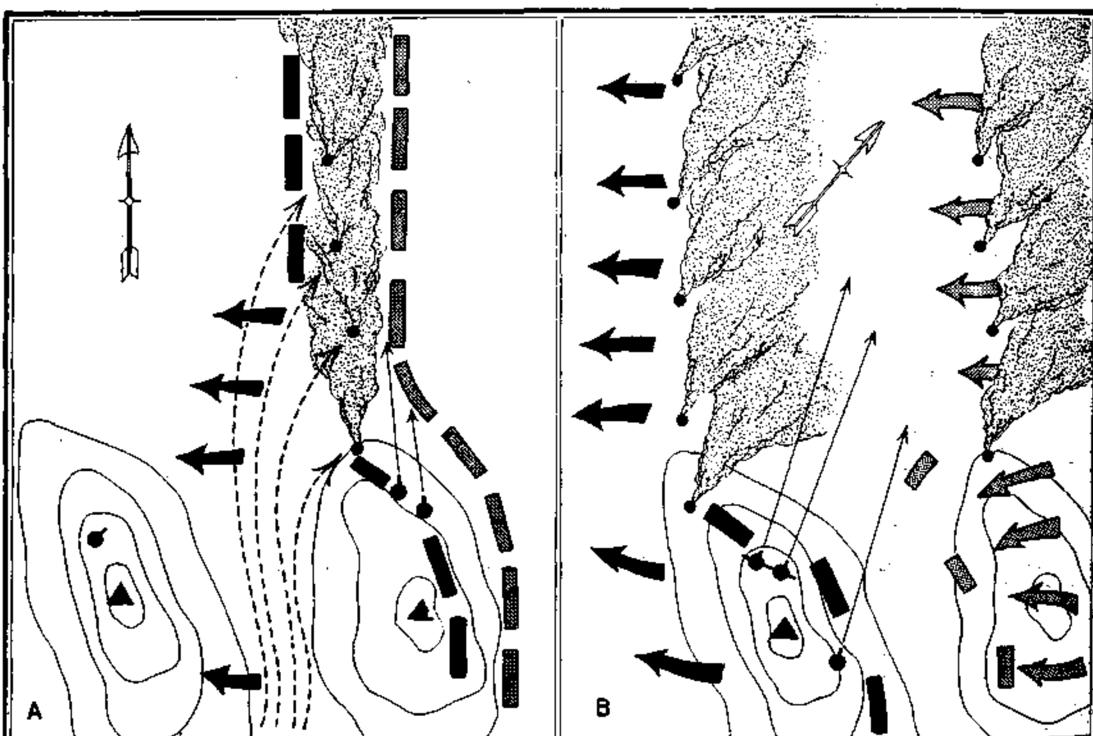
FIG. 6

(3) <u>In Breaking Contact During Combat</u>

For this purpose smoke is of valuable assistance. It facilitates disengagement from the enemy by day, because it is a substitute for insufficient terrain

[redacted]

cover. Whenever possible, the enemy should be blinded by smoke-producing ammunition. Generally, the withdrawing troops can also be covered by sprayed smoke, in many cases even if the wind is blowing in the direction of the withdrawal. However, in general, the timely employment of smoke sprayers is possible only in case of previously planned preparations for vacating a position. Possibly, the smoke apparatus ~~may~~ fall into the enemy's hands. The advancing enemy should be held up by observed or planned fire as soon as the smoking or rearward movement begins, in order to prevent him from using the defender's smoke to maintain pressure on the withdrawing troops (see figures 7 and 8).



Use of smoke to facilitate a withdrawal. Several smoke screens established successively. A - Initial phase, B - Continuation.

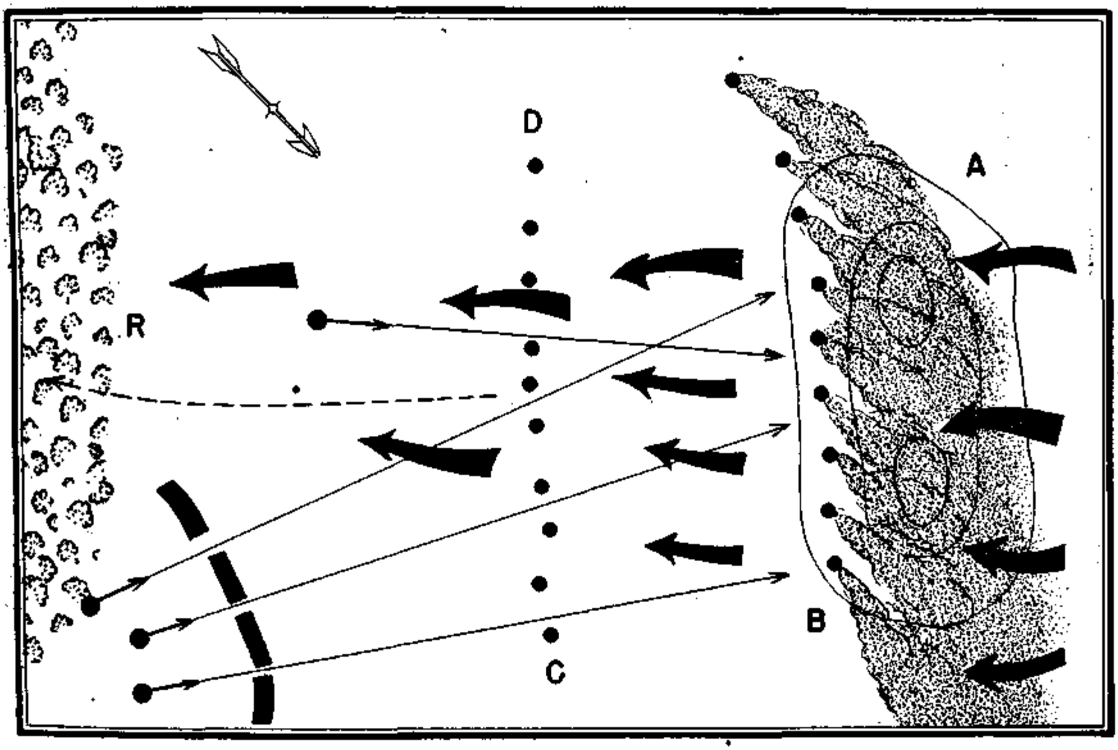
FIG. 7

(4) The Blocking Out of Air Observation

This requires a great expenditure of smoke ammunition. Therefore the exclusion of air observation by smoke is possible only for short periods of time. The establishment of a complete smoke cover that cannot be seen through from above can be accomplished only under especially favorable weather and terrain conditions.

[redacted]

Combat bridge construction and large ferries cannot be concealed from the air by smoke for long periods of time. Likewise, troop movements can be concealed only during short marches, for example, troops moving from a dispersed or camouflaged formation into natural cover. Smoke makes low-level air attacks more difficult. Where such attacks are to be expected, it is recommended by the Italians as a preventive measure to smoke troop formations, for example, when the troops are emerging from a defile. According to American opinion, large installations cannot be defended against aerial bombing attacks by the normal service smoke materiel.

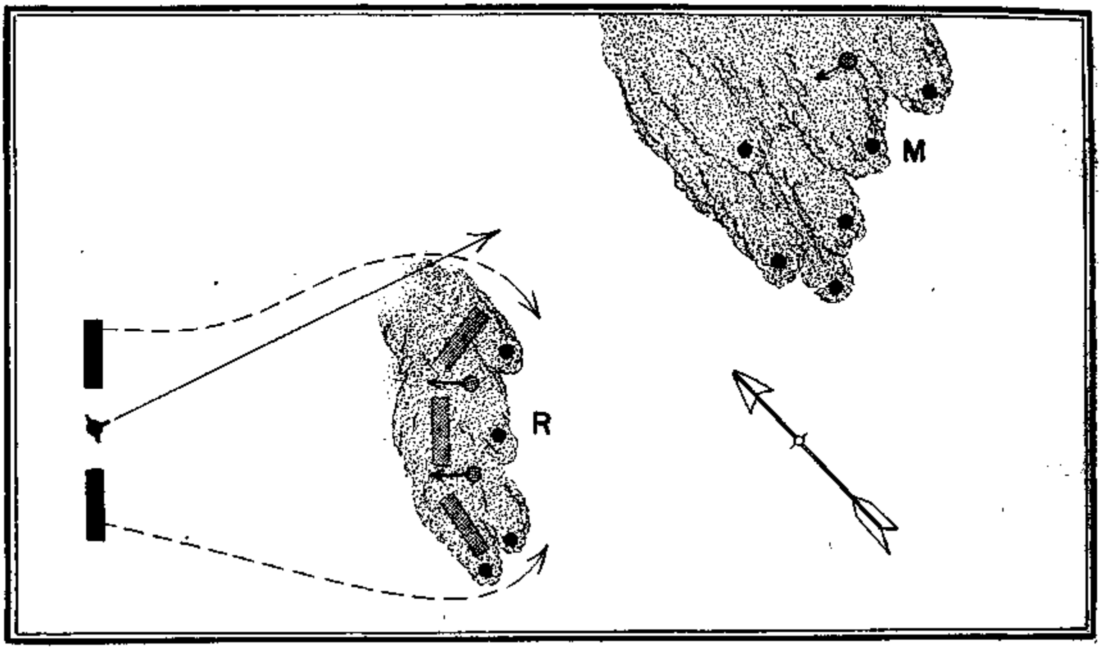


Rear guard, concealed by released smoke, withdrawing from the heights A-B. Smoke is prepared to be released on line C-D. R is the rearward or assembly position.

FIG. 8

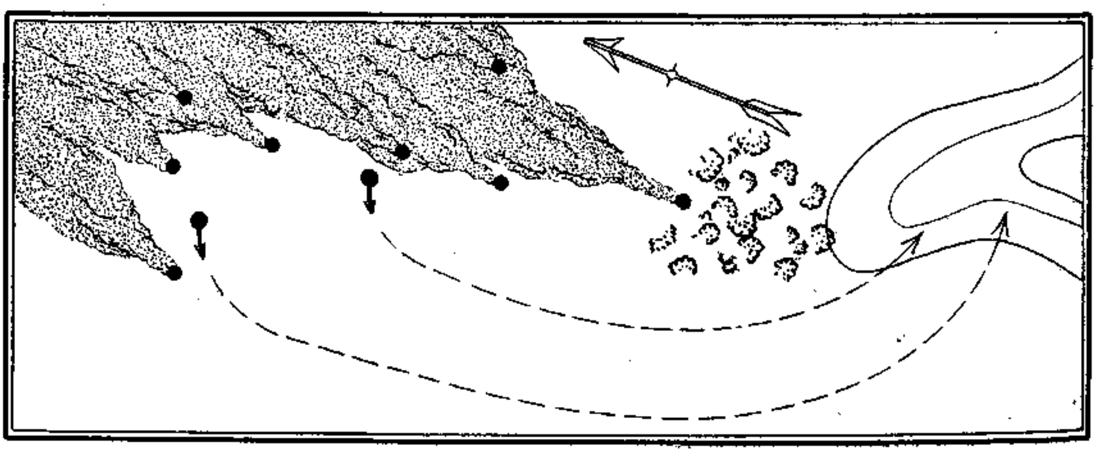
(5) Deceptive Use of Smoke

Smoke may be used deceptively to divert hostile attention and fire from decisive positions. For example, in river crossings it may be used at many places to deceive the enemy as to the location of the contemplated crossing point. The dimension of the deceptive smoke cloud must be such as to make it appear to serve an important purpose in the combat situation.



Use of smoke in an attack against a machine-gun nest. Mortar smoke shells used against M. Rifle smoke grenades used against R.

FIG. 9

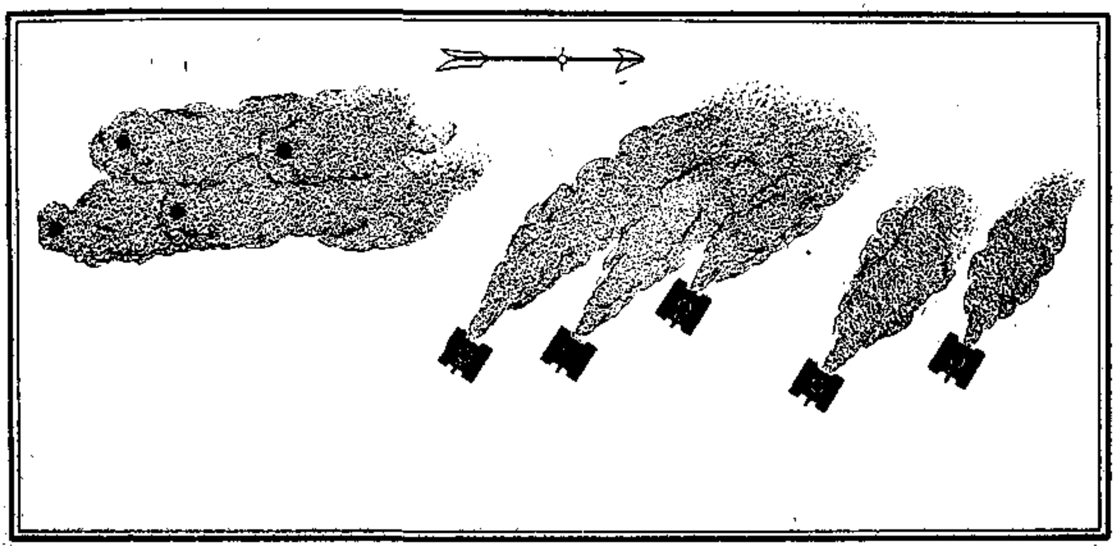


Machine-gun section under hostile fire changes position while screened by smoke from smoke candles.

FIG. 10

e. Use of Smoke in Small-Scale Operations (Limited Areas)

In such situations, smoke operations should be carried out with the combat troops' organic facilities, such as smoke candles, smoke hand and rifle grenades, artillery and mortar smoke shells, as well as smoke sprayers on armored vehicles (see figures 9, 10 and 11).



Tanks withdrawing while screened by their own smoke. The flank vehicles are screened by smoke produced by an artillery battery.

FIG. 11

f. Combat in Smoke

Smoke hinders the defense more than the attack.

Troops moving cross country in smoke maintain their direction by compass. In order to keep troops in hand it is at times practical to move them by bounds. In smoke, troops should advance silently and attack resolutely. The decision is secured in close combat. Upon contact with the enemy, attack him immediately with the bayonet, hand grenades, and loud yells.

In defense, the direction of fire should be definitely established and a plan of fire should be prepared in advance, thereby guaranteeing effective fire even in case of a surprise attack supported with smoke. Upon the appearance of smoke, do not fire until it is established that the enemy is actually attacking. On threatened positions, keep detachments close at hand for counterthrusts with bayonets. Counterattacks generally should be launched just after the disappearance of the smoke.

When encountering hostile smoke put on gas masks and keep them on until it is definitely determined that the smoke is not mixed with other chemical agents.

Front line troops should open fire individually against hostile smoke only if it is directly in front of their own position. The enemy may display smoke to divert fire from his own important positions. Combined fire will be ordered by higher authority. Friendly air reconnaissance should determine definitely what the hostile smoke conceals.

* * *

COMMENTS

(1) It is interesting to note the German conception of American, Swedish, and Italian opinion on smoke employment. This and similar German texts indicate a detailed study of American experiments and conclusions concerning the use of smoke.

(2) In order to disperse the hostile fire that it attracts, smoke should cover a maximum area, if it is to be placed on terrain in which friendly troops are operating. However, the possible hindrance to friendly artillery observation, friendly fire, and troop movements, should always be taken into consideration in decisions to use smoke. Even if handicapped by smoke artillery can continue to execute its previously prepared fires, but it cannot recognize or fire effectively upon new targets. In view of the above considerations, the Germans have not emphasized the development of smoke-spraying vehicles for use in support of front line units. They prefer to use weapons firing smoke-producing ammunition instead

(3) The Germans believe that it is generally unnecessary for the defender to leave his cover and move within the view of an attacking enemy. Therefore, the use of smoke by the defense against an attack is usually undesirable, since the strength of the defense depends mainly on the effectiveness of aimed and observed fires.

(4) It must be assumed that the purpose of smoke during a daylight withdrawal will be immediately recognized by the enemy who will increase his efforts to push after the retiring troops. Smoke alone will not hold the enemy away. Therefore, in such situations German artillery and other heavy weapons supporting a withdrawal, will increase their fires against favorable targets, previously selected and registered upon. These weapons will also be prepared to place aimed and observed fire upon the advancing enemy as he emerges from the smoke.

(5) It is noted that in this and other texts, as well as in accounts of combat experiences, the Germans frequently use smoke as follows: to conceal movements of armored and foot troops, especially from the flanks; to deceive the

enemy, by judiciously placing it at seemingly logical and important points; to reduce the ammunition expenditures required to neutralize hostile weapons, especially those in threatening positions that afford good natural concealment and at the same time cannot be efficiently combatted by armored vehicles, infantry weapons, or artillery.

(6) Whether the use of smoke brings the intended results, depends upon the ability of the commanders concerned to achieve a clever cooperation between the effect of the smoke, and the fire and movement of the combat troops.

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TACTICAL AND TECHNICAL TRENDS

NUMBER 33 **9 SEPTEMBER 1943**

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SECTION I

1. AXIS USE OF CAPTURED U.S. AIRCRAFT

The use of captured U.S. aircraft by the Axis countries should be seriously contemplated, in view of certain incidents which have occurred during the last few months both in the Pacific and over Europe.

Early in the year, there were two distinct occasions where unidentified U.S. Navy planes were observed in the Pacific area. One hovered over one of our task forces for a good part of a day, apparently on a reconnaissance flight. Another failed to respond to proper recognition signals. It is believed that some of these planes may have been captured by the Japanese and are in use for reconnaissance purposes.

On the Western front, sightings of B-17's apparently enemy operated, are increasing. Returning from one recent mission, the first wing of our heavy bombers was joined by one unidentified B-17 which accompanied the formation until near the German coast when it met some twin-engine enemy planes and turned back with them. While the purpose of this particular manoeuver remains in doubt, the inherent dangers are obvious, although to date no attempts to imitate American markings have been observed. This is further illustrated by a recent report that on the return flight from an attack on a town in central Italy, one of a number of unescorted B-17's was destroyed and three damaged by a P-38 marked with a swastika which made five determined attacks on the formation. The next day, during a return flight from northwest Sicily, a formation of light bombers was trailed by a tan-colored P-38 for forty miles before it turned back towards Italy. Photo reconnaissance has indicated the presence of one of these fighters on a nearby Italian airdrome. On another occasion over France, a P-47 was observed flying in company with an Me-109 and another enemy plane.

In addition, a Fortress has been photographed at a German Air Force experimental station and reports that the enemy has in his possession examples of other U. S. aircraft in good condition have been received from time to time.

While all such information must be treated with some reserve, due to the possibility of mistakes in recognition under the difficult conditions which usually apply, the possibility that the enemy may continue to use captured aircraft against us cannot be dismissed, although the practical difficulties involved in such operations might be thought to outweigh other considerations.

2. GERMAN AIR TACTICS--RUSSIAN FRONT

The importance of aircraft concentration over one particular area to support a ground thrust was recognized by the Germans in the battles on the Belgorod and Orel-Kursk sectors according to an article appearing in the "Red Star", 11 July 1943, as described by a field officer of the Red army. It was necessary for the Germans to concentrate aircraft in order to obtain local air superiority in these sectors even for a short time. The article in question follows

in the form of an English paraphrased version of the translation.

* * *

The distinguishing feature of the battles on the Belgorod and Orel-Kursk sectors during the past week has been one of fierce engagements over the battlefield. As distinct from former tactics, the Germans have set only one problem before their aircraft - the closest possible coordination with tank and infantry units in breaking through our [Russian] front line of defense and in exploiting the success. Thus, all the air engagements took place over a narrow strip, a few kilometers wide, along the entire front.

The tendency of the Germans is to mass as many planes as possible over the battlefield at the greatest possible height. In doing this, several new aircraft have appeared on the front, such as, the Ju-87 dive bomber with retractable landing gear and mounting a 37-mm gun; the long range 4-engine He-177 bomber with a heavy bomb load; the Me-109G with a pressurized cabin designed for high-altitude battles.

The work of our fighter aircraft over the battlefield is divided into three main parts, closely linked together:

(1) Combat with enemy fighters to gain air supremacy so that other types of our aircraft can operate more safely in the area;

(2) Direct support and protection of our bombers and Stormoviks during raids on ground formations;

(3) Attacks on enemy bombers to reduce the effectiveness of their bombing.

This last type of activity is one of the most important in fighter operations. The Germans use two methods for supporting and protecting their Junkers and Heinkel bombers over the battlefield:

(1) Massed concentrations of German fighters are used for neutralizing our fighters in the front-line area; (2) fighter escort is divided into two parts - one fighter escort preceding the bombers to engage our fighters behind the front lines, and, simultaneously, another close escort accompanies the enemy bombers.

Practice has shown that if the German fighter tactics are broken up in time, the enemy loses the initiative and suffers heavy losses. The following two episodes are examples of this:

On the first day of the battle one large group of our fighter planes on its way to the front, was met several times by a "shield" of German fighters. This group then divided into two parts. One part engaged with the enemy "shield", as before, holding the Germans in the area where they had chosen to intercept our fighters, while the other part changed course and intercepted groups of German bombers as they came up to the front line.

On another sector of the front one of our fighter formations continued the attempt to break through this shield, rather than going around it. The enemy, however, by distributing their forces at various altitudes, was able to keep our fighters engaged. Although we inflicted heavy losses on the enemy fighters, their bombers were unmolested.

The fact that the enemy has large plane concentrations adjacent to front lines must not cause fighters to be diverted from their main objective - that of attacking German bombers. Although fighter-versus-fighter battles clear the sky of enemy aircraft, this type of activity should be coordinated with fighters sent out only to intercept German bombers. Hence the tactics:(a) German "shields" of fighters must be engaged by aircraft sent up for this specific purpose. (b) at the same time, other fighters must be sent out to intercept and destroy German bombers as they approach the front lines.

Such tactics have had good results on one sector of the Belgorod front, where the majority of planes shot down were intercepted bombers.

German ground forces are well equipped with antiaircraft artillery and large fighter patrols are maintained to intercept our Stormoviks and bombers. The antiaircraft guns are coordinated with fighter operations.

As a group of our Stormoviks prepares to bomb, the German antiaircraft immediately ceases firing to give the Messerschmitts and Focke-Wulfs a chance to attack. Therefore, our fighters must accompany the Stormoviks throughout the whole raid so that they will not suffer heavy losses in such attacks.

The experience of these recent battles shows that the work of protecting and supporting our bombers and Stormoviks must be organized in two ways:

(1) Close escort fighters retain their former tactics, protecting the Ilyushin-2 Stormoviks from large fighter patrols.

(2) When no enemy fighters are in the air, our fighters aid the Stormoviks in neutralizing enemy antiaircraft batteries.

The commander who organizes the escort should detail several fighters for this duty. In fighting our Stormoviks the Germans use a number of methods based on surprise. Their fighters keep to the side, ready at any moment to exploit the least error made by our escort formation.

For example, a shock group of Yakovlav-7 fighters engaged 4 FW-190's which had been specially sent out for diversion purposes at approximately 3,200 feet to 5,000 feet above a group of our Stormoviks. Seeing this, 10 other FW-190's attacked the Stormoviks which had been left with only two fighters to protect them. The enemy was beaten off but did not suffer any losses, as would have been the case had our shock group been at hand.

The duty of our commanders is to keep the initiative, and this can only be

done if each new tactical method of the enemy is quickly understood and countered.

ANTIAIRCRAFT

3. THE BRITISH AERIAL DART GUN FOR TRAINING AA MACHINE GUNNERS

To provide moving antiaircraft short-range targets, the British have a piece of training equipment with a number of interesting possibilities called the "Aerial Dart Gun," see figure 1. The gun fires a "dart" not unlike a small mortar bomb, fitted with colored streamers, which can be made to simulate an approaching dive bomber, a crossing or a departing plane. The flight of the dart is similar to the flight of a clay pigeon in trap shooting.

While the American army lacks the dart gun, with a reasonable amount of ingenuity, a similar device could be developed using a rifle grenade or even a 60-mm mortar, a 37-mm AT gun or possibly a catapult made of old automobile springs or an otherwise useless inner tube. The following description and account of the use of the gun is taken from a British source.

*   *   *

The aerial dart, fired by a simple gun, provides a realistic air target which can be used on all ranges suitable and classified for antiaircraft fire. Darts are recoverable and the only expendable item is the propellant cartridge.

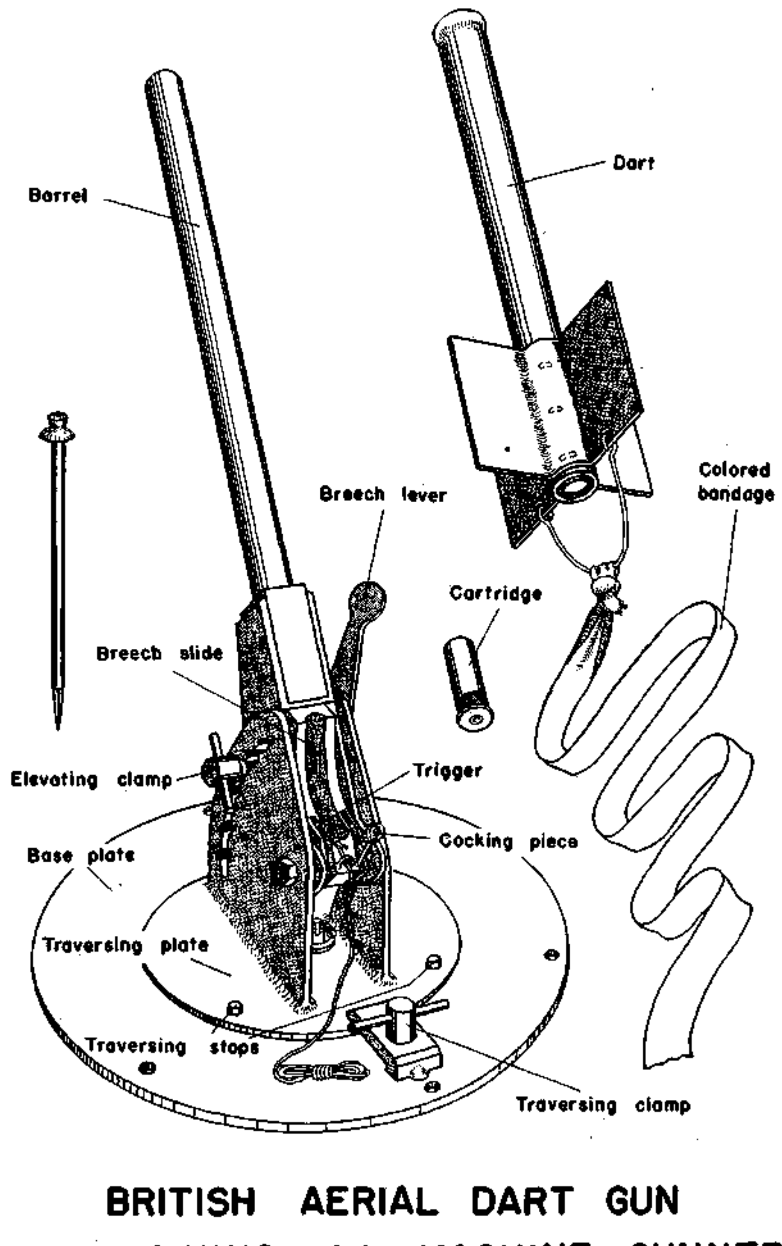
a. Description

(1) The Gun

This consists of a barrel, breech piece, and firing mechanism held in a quadrant which allows the barrel to be elevated or depressed. The gun is mounted on a circular base plate which permits a traverse of the barrel within an arc of 90 degrees. The dart is propelled by a 12-gauge cartridge filled with 70 grains of powder.

(2) The Dart

This is a steel tube, closed at one end, with a solid shaft running down the center of the tube which goes into the barrel. The tube itself fits outside the barrel. Four steel fins are fitted to maintain steady flight. A 4-foot length of 2-inch wide cotton bandage colored with ink, is tied to the end of the dart, and streams out during flight. The colors of the cotton bandage may be varied to suit the colors of the sky background: red, or red and white, is the most useful for the average British sky background. (This variation can be made very simply by the use of red ink.)



BRITISH AERIAL DART GUN
FOR TRAINING AA MACHINE GUNNERS

b. Use

(1) To fire the dart

Fix the base to the ground with the four steel pins, the traversing arc to the rear. Elevate the barrel to the height required. (See range table.) Open the breech, insert a cartridge, and close the breech. Put the dart into and over the barrel, with the cotton streamer on the ground and clear of the gun. Cock the trigger mechanism and, on the order to fire, pull the trigger cord.

(2) To unload the gun

Open the breech and, with the aid of a steel rod inserted in the barrel from the muzzle end, push out the empty cartridge case.

(3) Care and cleaning

(a) The gun should be cleaned in the normal way after firing, and left slightly oiled until next required.

(b) Care should also be taken to ensure that any dirt or grit is removed from the inside of the dart tube, and the solid shaft.

(c) Streamers should be examined before firing to see that they are securely fastened to the dart. If a streamer breaks away in flight, it makes the retrieving of the dart a matter of some difficulty

(d) The darts, on landing, may penetrate deeply into the ground, particularly if it is soft.* Care must be taken when digging them out to avoid damaging the darts, which are made of light metal since their future efficiency may be impaired.

(e) If possible, avoid firing darts on to hard ground.

c. Range Table

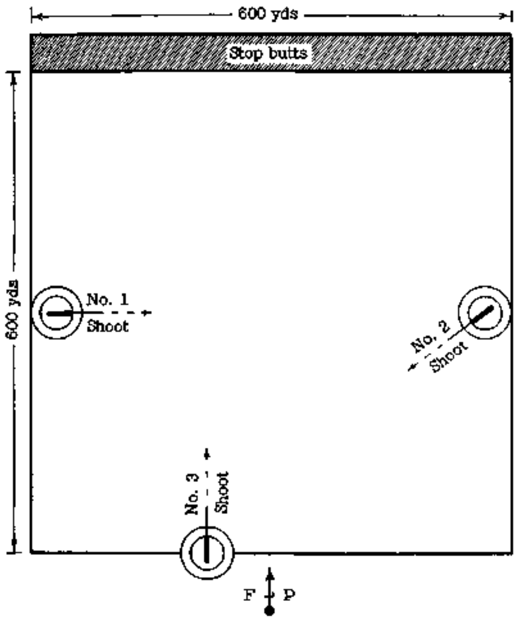
The following table gives the performance of the darts at various angles of the barrel:--

Elevation of Barrel	Height	Distance
80 degrees	529 ft	100 yds
70 degrees	484 ft	175 yds
60 degrees	400 ft	245 yds
50 degrees	324 ft	265 yds
40 degrees	256 ft	315 yds
30 degrees	169 ft	265 yds

*Painting the dart red might make recovery easier.

d. Suggested Firing Practice

No. 1 Course. Dart gun on a flank (right or left) about 300 yards in front of firers--barrel at 40 degrees--dart fired diagonally across front to a point about 50 yards to the left (or right) of and in line with the firing point, representing an aircraft approaching diagonally and diving on a post to the left (or right).



No. 2 Course. Dart gun at the firing point with the LMG--barrel at 80 degrees and pointing up the range--the dart will go up to about 500 feet, and come down about 100 yards in front of the firing point; representing a dive bomber.

No. 3 Course. Dart gun on a flank, about 300 yards in front of firers--barrel at 40 degrees--the dart fired directly across the front, representing a "direct crosser."

e. Notes

(1) Dependent on the size and shape of the range, many other courses can be arranged.

(2) As a safety precaution, the dart should be tried out, and the base plate setting barrel elevation corrected before any firing starts.

(3) If the dart gun is fired from inside the danger area, a pit must be dug for the firer from which he can control the dart gun, which must itself be fixed near the pit and in the open.

(4) A look-out should be detailed to pin-point the fall of each dart so that collection after firing is simplified. Men should not be posted in the danger area for this purpose, since it is not always possible for them to follow the dart in flight and there is therefore a risk that they will be hit by dart or bullets.

4. PROTECTION AGAINST DIVE BOMBING

According to an American officer recently returned from Tunisia, while dive bombing is extremely trying to the nerves of unseasoned troops, it produces few casualties, particularly when slit trenches are at hand. If 50-caliber machine-gun fire is available, the bombers are forced to remain at altitudes from 500 to 1,000

feet, which makes their machine-gun fire ineffective and their bombing with from 100 to 300-pound bombs inaccurate. (See Tactical and Technical Trends No. 30, p. 6). If, however, 50-caliber fire could not be brought to bear, the bombers would come down close, even to 50 feet, and spray the ground with machine-gun bullets. Due to the speed of the plane, such fire was scattered over a large area and few hits were scored. One unit of 190 men was bombed 26 times in a day, for the most part by individual planes, with the loss of three men; another experienced three 30-plane attacks, with very few casualties.

The reactions of men to dive-bombing differ. At times, they will stand up and watch an attack being made a short distance away, while at other times they seek cover when there is no danger whatever. Frequently, rifle and light machine-gun fire is opened at 500 to 1,000 yards--utterly ineffective ranges--and the widely dispersed bullets cause casualties among other friendly troops. To be effective, rifle and 30-caliber machine-gun fire must be held for extremely close range, a few hundred feet, practically pistol range.

Men should be gotten out of slit trenches as quickly as possible after the immediate danger is past.

In connection with antiaircraft fire against low-flying planes, a flying officer recently returned from New Guinea reports that at Buna, our strafing planes encountered heavy explosions at about 200 feet elevation, and suggests the Japs might have been using a mortar. This development offers an interesting field for experiment.

ARMORED

5. GERMAN TANK RUBBER ANALYSIS

Analysis by British engineers of samples of natural and artificial rubber taken from the PzKw 3 tanks discloses some interesting points which are worth recording.

Two very similar articles, i.e. a vision forehead pad and a cupola pad of a 1940 model of this tank proved to be very different when analyzed. The former was made of natural rubber and was secured to the metal by the brass plating process. The cupola pad, on the other hand, was made from synthetic rubber and was attached to the metal by an adhesive paint. These samples confirm the previous supposition that the Germans have not yet learned how to make an efficient joint between synthetic rubber and metal.

The most interesting sample, however, was a section of a bogie wheel tire from a PzKw 3 tank (probably 1942). This sample proved to be made of synthetic rubber. This is said to be the first evidence received by the British authorities of this material being used by the Germans for solid tires. It seems to show that the Germans have made sufficient technical progress to overcome the heating

difficulties previously arising when synthetic rubber was used for this type of work. The method of adhesion to the metal band was by means of an intermediate layer of hard, probably natural rubber.

6. MOUNTING OF 50-MM (2 IN) Kw.K 39 TANK GUN

A preliminary examination in the United Kingdom of a captured PzKw 3 Model L (Tp)* has disclosed that the long-barreled 50-mm tank gun, 50-mm Kw. K 39, is balanced by means of a torsion-bar compensator.

As shown in the sketch, the torsion bar is mounted on the inside of the turret roof parallel to the trunnion axis and is anchored at each end. An arm is attached to the center of the bar which carries at its free end a pair of rollers. The bar is pre-set so that the rollers exert a downward force on a flat plate bolted to the gun cradle a few inches from the trunnion axis.

It will be seen from the sketch that, as this plate is fairly close to the trunnion axis, the maximum twist of the bar (from full depression to full elevation) is quite small.

The short tank gun, 50 mm Kw. K, in a captured PzKw 3 Model J previously examined was balanced by a coil spring in compression on the right of the mounting.

ARTILLERY

7. DECEPTIVE GERMAN ARTILLERY METHODS

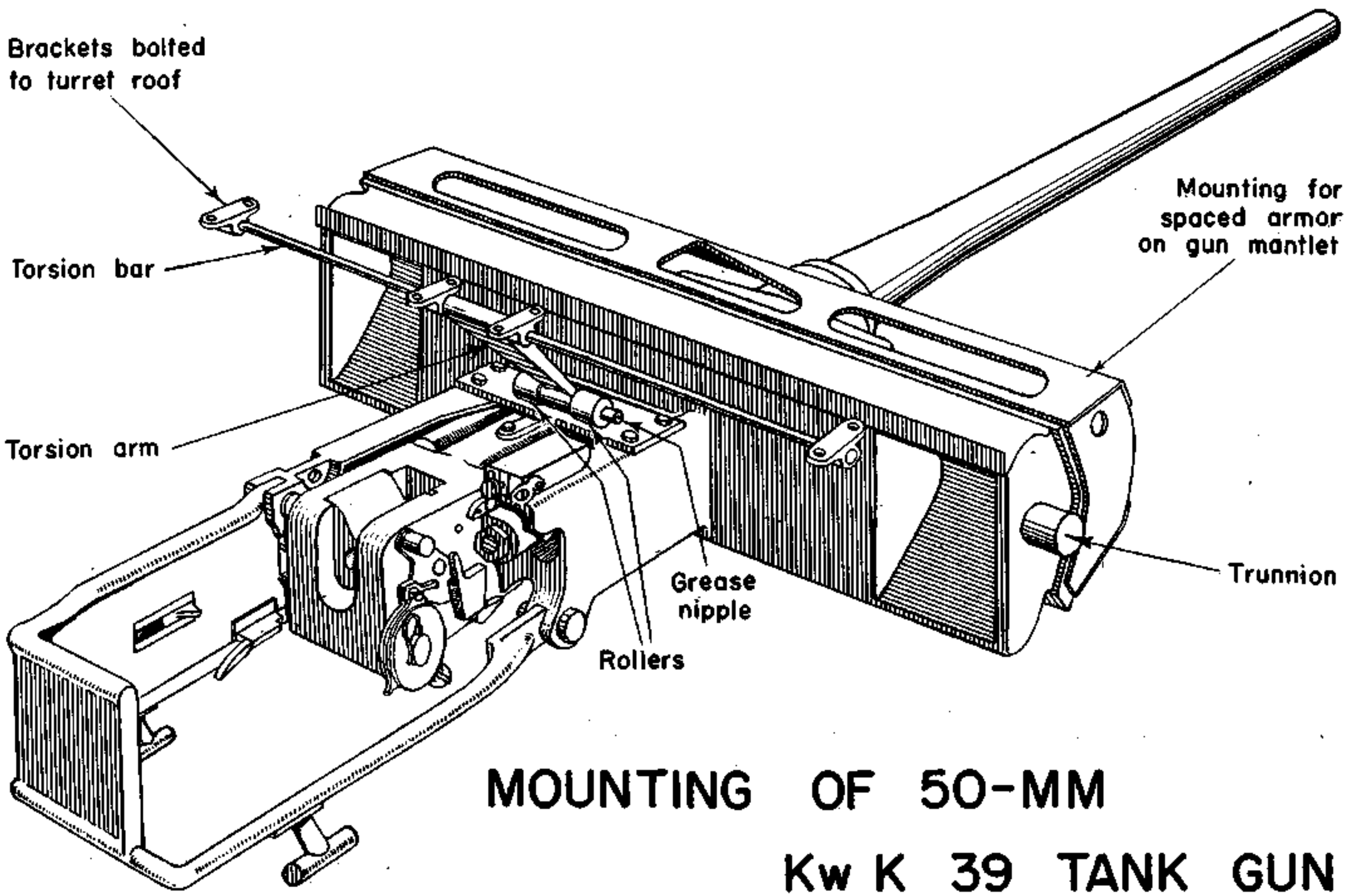
Introduction

In the following article translated from a recent issue of the "Red Star", some German methods of counteracting Russian sound and flash reconnaissance are examined. For a description of similar tactics see Tactical and Technical Trends, No. 31, p. 15.

* * *

Since the results of sound reconnaissance depend on atmospheric conditions, Germans always try to use these to their advantage. For example, when sound carries well, (at night, in fog, on calm days) Germans try to use their artillery as little as possible. On the other hand, when sound conditions favor the Germans

*The abbreviation Tp (Tropmunition) following the model-letter of the tank indicates that this tank is adapted for use in the tropics.



MOUNTING OF 50-MM
Kw K 39 TANK GUN

(wind in the direction of their positions, vertical midday currents, sharp drops in temperature etc.) the activity of their artillery increases. In selecting their firing positions Germans take into consideration the effect of the surrounding terrain on sound. Firing positions on the reverse slopes of the hills, in groves, near lakes, and marshes are more desirable in this respect than those on tops of hills.

In order to deceive our sound reconnaissance and to draw our fire on empty positions Germans use "swinging" or "duty" batteries (American roving guns). These batteries swinging from one position to another, fire a few rounds from each position, mixing it occasionally with systematic fire. These positions are selected away from other batteries and other troop positions. Germans are very careful not to disclose their fire system. Many batteries do not fire for a long time as their mission is to ambush either our troops or our batteries. Almost never does a gun fire individually as it is then easily located by sound reconnaissance; instead, as a rule, several batteries fire together at an even tempo so that individual shots are drowned in the general noise.

To camouflage fire activity of especially important positions special devices are used that imitate sounds of gunfire. These devices are placed from 200 to 300 meters on the flanks of the camouflaged battery, or to the rear with respect to the direction of actual firing. Sometimes, for more complete imitation of a battery, these devices are supplemented by others which produce a flash simultaneously with the real volley.

Along the same principle a single piece located also 200 to 300 meters from the others is used for ranging fire. This piece if moved farther away, would interfere with correct ranging for the rest of the battery and would also enable us to discover the trick. These seperate pieces also have the secondary mission of nuisance fire. If several batteries are to take part in a barrage, these ranging pieces are used during the first stages. As soon as the Germans think that our sound reconnaissance has located these pieces, the rest of the guns open up. The ranging pieces continue their fire until the end of the barrage.

In order to hide their guns from our flash locators, very often rockets are sent up, haystacks and other material burned, so that the gun flashes are nearly invisible against the burning background. Smokeless powder and flash hiders are also used. Large-scale engineering works are made in order to hide the batteries from ground and air observation. Each battery has two camouflage experts who supervise this work.

Of course, all these measures are not taken by every German battery all the time, but it is well to know about all these tricks. Such knowledge enables us to evaluate properly the findings of our flash and sound locators, and when everything else fails we check our evaluation with PW interrogation.

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8. ARTILLERY IN COMBAT IN WOODED AREAS

The following personal critique by a German artillery officer on artillery in combat in wooded areas is taken from a translated German document.

*　　　　　*　　　　　*

a. Example 1

An infantry regiment, reinforced by my light field-howitzer battery (probably 105's) horse-drawn, received orders, late in the afternoon, to push forward toward the east through extensive forest region, turn off to the right at a crossroad, and relieve the left flank of the neighboring division by making an attack.

It was nearly dark before the column of march advanced. The deep sand of the road and the necessary reconnaissance, caused the column to halt more than once. Tall trees alternated with those of recent growth. There were a few small clearings along the roadside but no large, completely cleared areas. The battalion to which the light field-howitzer battery was attached marched close behind the battalion forming the advance guard.

In the meantime, it had grown dark. The first shells burst over the point, more than a mile from the crossroad. Everyone halted and then the order rang out: "Antitank troops forward!" and "Artillery will fire!" The commander of the infantry regiment, who marched behind the point, turned to me and asked "Can you fire?" A fire mission! thought I. In a forest! At night! The enemy red-green map on a scale of 1:100,000! Our own position? The enemy? "Can you fire?"

One must try anything.

I hastened back and found a partially cleared place where one could fire fairly well between the trees. A gun commander was instructed to place at least one gun in position as quickly as possible. This took some time, for the infantry's moving of baggage and supply trains with the advance guard battalion barred the way of the guns. The din of battle grew ever stronger. While we were searching for gun positions, the gun commander asked me somewhat diffidently how he should lay and fire the gun with the map he had. I asked him in return, "Where is the most combat noise?" "There", he said. "Then aim your guns at that place! I estimate that the distance to our point is 800 yards. For safety's sake, begin to fire at 1,200, and fire two high bursts, then lower your gun and begin to use percussion fuzes. Bring your fire back to the target. Establish a forward observation post near the infantry."

"If things only go well," the expression on the lieutenant's face seemed to say.

And things did go well. We saw the third burst against the background of the evening sky. We fired shells equipped with percussion fuzes by ear (it had grown quite dark in the meantime) and brought the fire back to the target. The infantry

was happy. It repulsed two attacks by the enemy.

We had not hit anything--the shots had gone over--and as the lines were only 30 yards in front of us, we couldn't bring the fire any closer. The infantry, however, swore by their artillery battalion, and the moral value of the fire, completely offset its lack of material effect.

b. Example 2

We, that is, our division and my light horse-drawn field howitzer battalion, relieved an armored division that had pressed forward to the western border of a strongly defended city but could get no farther because of deep minefields, tank traps, and the river. The period of position warfare lasted a month. We were at first provided with poor maps, but finally obtained captured maps on a scale of 1:50,000. The observation posts and command post were necessarily located at the edge of the wood 300 yards behind the front line. Only from the observation posts was it possible to get a fairly good view of the city and of the slowly rising open hinterland behind it. These posts were fitted up at night and carefully camouflaged. As we learned later from the enemy's position, these posts could not be seen. The flying bullets of the enemy infantry, however, constantly whined among the trees and made our stay there very unpleasant. The enemy artillery likewise beat the edge of the wood with a brisk fire. The fire-control wires were destroyed many times every day. Even the radio often failed us, largely because of the difficulty of supplying the anode batteries. The observation posts were connected with one another as well as with the battalion command post, and the battery positions were also connected with one another. Subdivisions of the battalion were interconnected; thus, for example, on a day when the enemy attacked and all the wires were destroyed by artillery fire, the fire of the entire battalion was controlled by the one remaining radio circuit of the battery within calling distance of the observation post.

c. Example 3

The enemy had pushed forward a salient in wooded and swampy terrain. The division, to which my mountain artillery battalion belonged at this time, was driven from the railway during the combat.

The infantry of both sides lay in the dense wood with lines not more than 50 yards apart. There were no elevated observation posts, consequently, our OPs were located in the front line. The longest view - 80 yards - was in a sparsely wooded area. In view of the dispersion, the center of impact of the barrage fire was 300 yards in front of the main line of resistance and consequently failed to accomplish its purpose. The fire was adjusted only by ear. It was necessary to adjust separately the fire of each of the guns laying the barrage and to check their adjustment separately twice a day. When our battery positions were surveyed in, we used map data to fire upon enemy positions, supply lines, and concentrations, deep within his combat zone (map on a scale of 1:50,000 and 1:25,000) and the fire was checked from time to time by aviators.

If the enemy was finally annihilated solely by artillery fire, this was due exclusively to the continuous bursts and harassing fire of the entire regiment. The expenditure of ammunition was heavy. My battalion (2 batteries) fired 17,500 shells during the 28 days. This method is really not "elegant", but it is impossible to do otherwise when fighting in wooded country.

d. Examples Compared

In example No. 1 there was no data relating to the position. The observation posts did not have a good view. Rough aiming in azimuth by ear, laying on any point, range estimated. In example No. 2 the positions were surveyed, the batteries interconnected, but only a small sector of terrain two miles deep could be seen from the observation posts. The laying was in the grid direction, ranges were obtained from the map. The regular firing method was used; smoke shells fired on a terrain, parts of which were not clearly visible. In example No. 3 the positions were surveyed but the observation posts did not have a good view. Laying was in grid direction, ranges obtained from map, fire brought back to the target by ear.

e. The Work in the Observation Post

In cases 1 and 3, the observation posts were located far forward. The lack of vision and the fact that the posts were located in the front line permitted the performance of only the most essential tasks. It was obviously impossible to employ the observation posts on a large scale. Radio communication, supplemented by wire, and binoculars were the means used by the battery commander's representative. Corrections in azimuth and range, given in meters with respect to the line of sighting, were supplied to the battery. In case 3, the battery commander's representative was expressly forbidden to give ranges over the telephone or radio, as the interception service of the enemy was working well and could easily draw correct conclusions concerning the location of the battery positions from the ranges given.

In case 2, the fire was also affected by the "front-line influences", although an ordinary observation-post service could be maintained. Command posts A and B (instrument section) and the observation post, situated within call of its battery, were actually in communication because within calling distance. Moreover, it was possible to reach the other observation posts through the infantry command post; the battery positions could also be reached by means both of an infantry wire and that of an artillery group. The supplementary radio connections also permitted communication, but were less used, as the enemy located them by means of a radio direction-finder. The great importance of having as many lateral radio and telephone lines as possible was plainly indicated. The control of fire by the battalion was always assured. The observation posts in trees were occupied only in the most urgent cases. The observers, who wore safety belts, occupied positions in the forks of branches rather high up in the trees. One observation post could use the battery commander's telescope, but the others were restricted to binoculars.

With respect to camouflage, it should be mentioned that it is more important to have a good background, that is, trees with thick foliage, than to use

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camouflage on the side toward the enemy. The branches must be changed frequently and must be cut from trees of the same species.

f. Possibilities of Barrage Defense Against Enemy Attack

The event which causes the artilleryman the most pain is when a shell falls short and drops in his own lines. Artillery fire in forest combat reaches a decisive stage at just this point.

The barrage fire, whose center of impact was between 200 and 300 yards in front of our own front line, was adjusted by ear! No rule gives any information as to how the distance of detonations is to be estimated in a wood, without interrupting fire if possible, as in case 3. Nor can one decrease the range until the shells begin to fall in our own lines, when one learns that it would have been better to keep it at a distance. Moreover, sound is deceptive. Many bursts that sound far away actually occur in the nearby underbrush, while many that sound near at hand result from detonation on distant trees. Here the difficulties begin.

Can we call fire directed behind the enemy's front line a barrage fire? In case 3, the enemy had always prepared for an attack in his front line, because he was safest from artillery fire there (according to the statements of prisoners). At most, the barrage blocks the second or third wave of attack and the supply lines. Our own infantry must always be apprised of this fact, for they must lay the barrage themselves.

Harassing fire and concentrations of fire on rear areas proved very effective, especially in case 3. This, in my opinion, is absolutely the only way in which artillery support can be useful in an engagement in the woods. If one has enough ammunition, the enemy can be driven out of the woods. There is little prospect, however, that artillery can be successful in supporting troops attacking in a forest. Enemy positions, supporting points, and bunkers can, at most, be recognized at a distance of 100 yards, a range at which the artillery can no longer fire upon them. Antitank guns, and particularly assault guns, on the contrary, have proven their usefulness. The forward artillery observer can at best only direct a scattering fire toward the rear. Attempts to measure the positions of tracer ammunition fired by forward observers have been useful in locating the position of the forward observer and the course of the front line. However, I would hardly recommend that fire be based on these measurements when all the tracer ammunition is not plainly recognized.

g. Conclusions

The lessons taught concerning artillery in a combat in the forest may therefore be summarized as follows:

(1) It is usually possible to fire only by ear in dense wood;

(2) The barrage as such is ineffective and constitutes a fire barrier only in front of the rear areas;

(3) The artillery cannot support attacking troops, for it can fire only from clearings in the forest and areas containing scattered trees;

(4) The main value of artillery in a forest combat is in firing upon routes over which the enemy approaches and areas in which he assembles;

(5) It is suicide to observe from trees in a dense forest, owing to the proximity of the enemy's front line;

(6) As far as possible, only forward observers should be employed in a combat in the woods; to establish a larger "command mechanism" in the front line will cost many casualties;

(7) The nearer the front line and the denser the forest, the more facilities for communication should be established. It is sometimes impossible to find wires that have been cut by artillery fire in a dense wood;

(8) Interconnection is of value only when the observation posts have more or less view or no firing maps are available. It seems useless in a dense wood unless air observation is available for adjusting the fire. No liaison plane is needed when the target is shown on the map;

(9) Under certain circumstances, however, artillery should fire during an engagement in a forest even when its "material" ineffectiveness is obvious, for its "moral" effect is always obtained;

(10) The artilleryman must never forget to explain in detail to the infantry the artillery's role in a combat in the woods, so that the former will have no expectations that the latter cannot fulfill.

ENGINEERS

9. BUILDING WITH NATIVE MATERIALS

There is an abundance of natural materials in the South Pacific which may be used to provide for the comfort of troops as well as for the protection of equipment. However such materials must not be wasted as they represent resources that should be carefully preserved for the population. Native methods of construction should be carefully investigated and improvements effected whenever possible.

Bamboo and rattan are the most universal of building materials among people of the South Pacific area. They are generally plentiful and easily available. No native material has proved to be more versatile or useful. Some natives say it is best to cut bamboo in the last quarter of the moon, as wood-boring insects are less apt to infect the wood when the sap is down. Rattan may be cut at any time. All sizes and shapes of bamboo are useful; however, the well-dried yellow stalks, about six inches in diameter, are best. Do not attempt to drive nails or screws

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through the wood without first boring holes--it splits easily. If nails or screws are not available, native methods of binding building members together can be used. As a structural member, bamboo is fairly reliable especially if seasoned. There are several methods of curing and insect-proofing bamboo; one is to soak the wood for at least a week in salt water; the other is to bury the freshly cut bamboo in warm sand exposed to the sun. Moderate heating of the sand hastens the process. Petroleum creosote, thinned and sprayed on, is effective. Smoking the bamboo will dry it and kill the insect larvae. Some of the uses of the material are wall sheathing, plumbing, furniture, lamp fixtures. When used for sheathing, it requires a backing of some sort, such as building paper, water-proof paper from packing crates, or salvaged canvas.

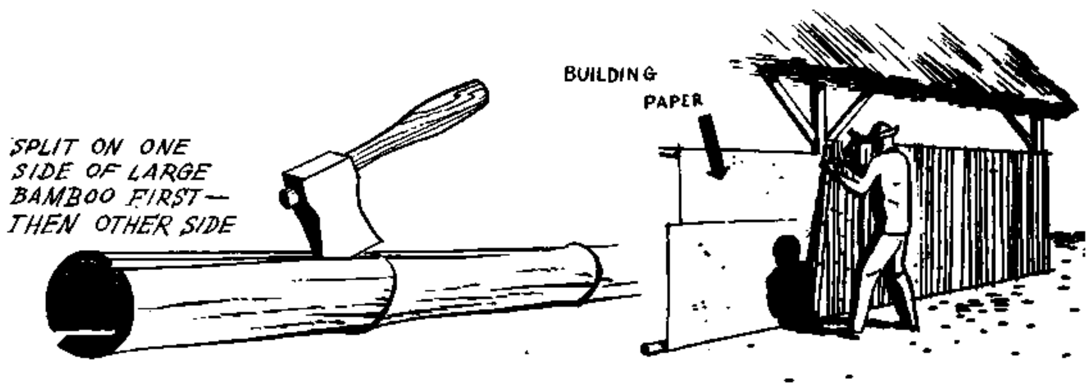


FIG. 1

As a ready-built, nature-supplied roof, thatching has no peer. Though to most Americans it is a lost art, it is very much in evidence throughout the South Pacific. The best material to use is three-foot-long swamp grass which should be cut with a sickle and tied into bundles of convenient handling size. The grass should not be put on the roof while wet. If well done, grass thatching is durable and water-proof, and should last for a number of years. The technique of thatch laying is specialized, but once the basic steps are learned, mastery comes easily. If it is possible, natives should be hired to do the first thatching job. Observation of their technique will be instruction enough.

Figures 2 to 6 explain the basic process as observed in the South Pacific. The thatching is started from a lower corner of the roof, and is laid on the horizontal rafter-branches. The first layer of grass is put on with the roots on the down-side, running the length of the building. The next layer is laid directly over the first, with the grass reversed--top down, root ends up; all the following layers of thatch are built up like overlapping layers of shingles. As each section of thatch progresses, branches are laid as shown in the illustrations.

The "shingles" are cinched with wire at 18-inch intervals; the wire "sewing" is done by a man standing underneath the roof, who uses a long pole with an

FIG. 2

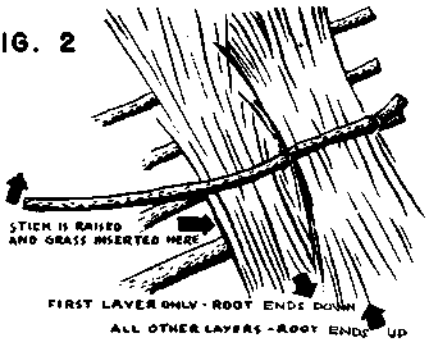


FIG. 3

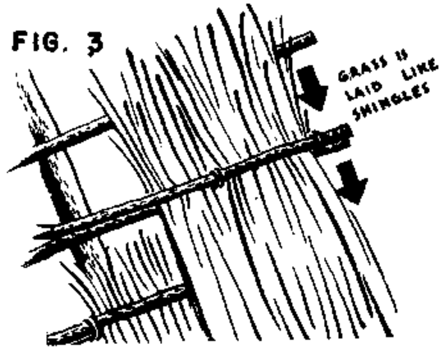


FIG. 4

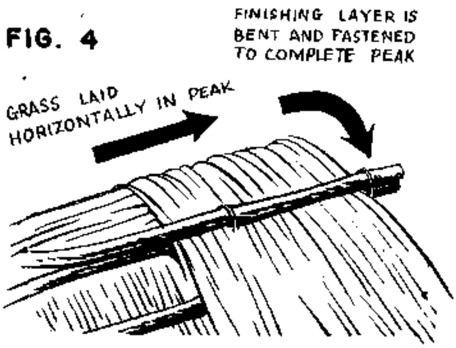


FIG. 5

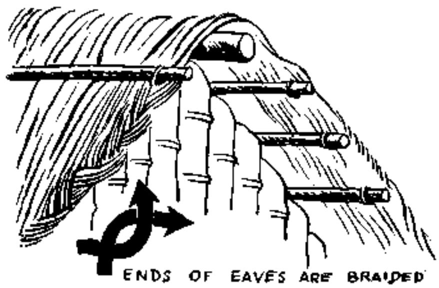


FIG. 6

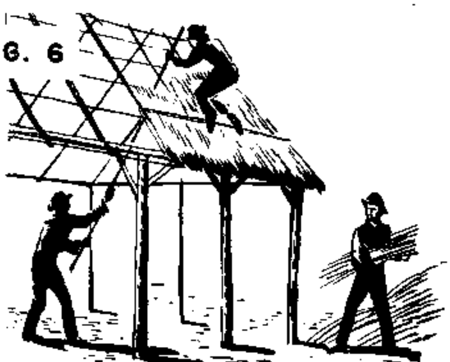


FIG. 7

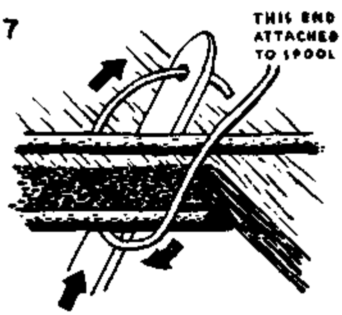


FIG. 8

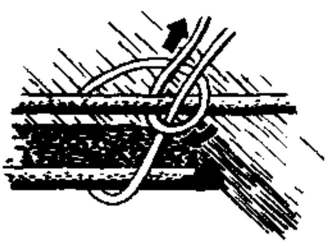
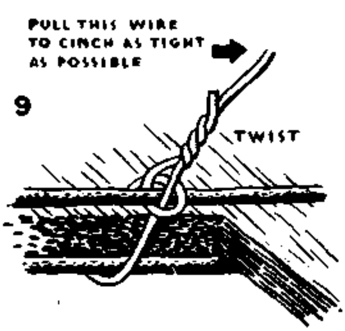
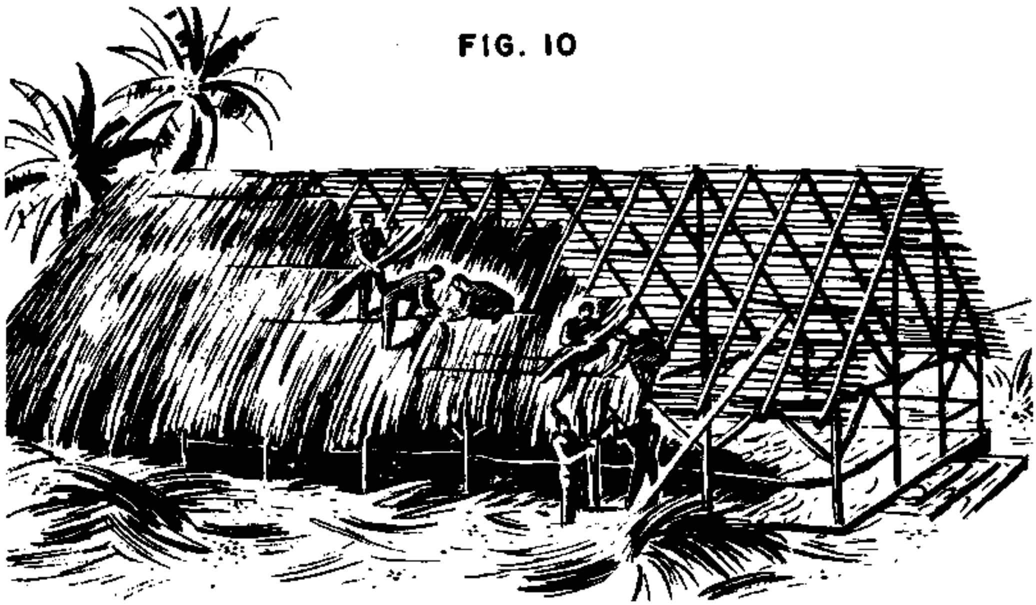


FIG. 9



eye in one end as a needle, see figures 7 to 9. This pole is flattened on the eye-end to permit easy passage through the thatch. The handler pushes the stick up through the thatch, next to one of the rafter sticks, where the man on top threads the eye with wire; the pole is then withdrawn and shoved through on the other side of the rafter, where the top man ties a knot as shown in the drawings. If no wire is available, rattan may be used. This process continues until the last layer next to the peak is reached. The peak is completed with bundles of grass laid horizontally and finished with a layer of grass bent over the peak and cinched on both sides (see figure 4). The water-proof nature of thatching makes it equally useful for the sides of buildings, where it is laid in the same manner as for the roof.

FIG. 10



Good, weather-proof, insulated walls can be made from a mixture of straw and mud. The technique most used by the natives of the South Pacific is rather like the method of laying plaster on laths. The building is first framed with upright poles, set into the ground six feet apart. Willow lath sticks are tacked horizontally to the poles, three inches apart. The adobe, which should be mixed with plenty of short straw, is then applied like plaster, two or three inches of it on each side of the framework. Another method is that of making adobe bricks with mud and straw poured into wooden moulds 10 x 12 x 4 inches. Well dried in the sun, they can be used like standard baked bricks.

[redacted]

10. METHODS OF CLEARING MINEFIELDS

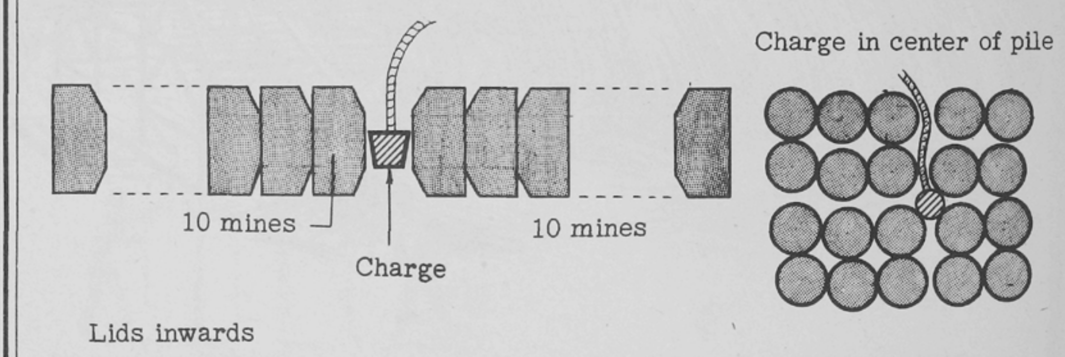
The importance which land mines has assumed in modern warfare has been discussed in Tactical and Technical Trends No. 27, p. 15, and No. 28, p 15 with reference to the laying of enemy minefields and the construction of enemy land mines. A knowledge of the different methods of clearing enemy minefields is as important as an understanding of the enemy tactics in laying the minefields. Information concerning the following methods for clearing minefields was taken from Allied sources covering operations in North Africa. In the first five methods the working party did not exceed one NCO and four men.

*　　　　*　　　　*

a. Lifting and Placing in Dumps of 20 to 40

After locating, the earth was cleared around the mines and, without touching the igniter assembly,* the mines were lifted and carried a distance of approximately 30 yards depending on the size of the dump.

They were either laid flat on the ground or on edge, with the top covers pointing inwards (see figure 1). The initiating charge was 1 primer, 1 detonator and 6 feet of safety fuze.



PLACING FOR DEMOLITION

FIG. I

In the open country, clear of buildings, water mains or telegraph lines, a series of dumps of 30 to 40 mines were blown electrically using the truck storage battery as an exploder.

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*Of course any booby traps would first be neutralized, and it is thought that the igniter's are also neutralized.

[redacted] [redacted]

The rate of work was 60 mines per man per day;
The number lifted by the method, 80,000 approximately;
Casualties - nil;
Failures during firing - nil;
Type of country - rough with average undergrowth.

b. Cat-O-Nine Tails

This was not very successful. Experiments proved that the method could only be used on very level ground and even then the mines cannot be drawn close enough (see figure 2) to insure that one charge will detonate them. It was found that they either had to be handpacked, or two or three separate charges were necessary to destroy each dump.

Rate of work (a) rough ground: no figure produced;
(b) even ground: 25 mines per man per day;
Number lifted by the method: 3,000 to 4,000;
Casualties - nil

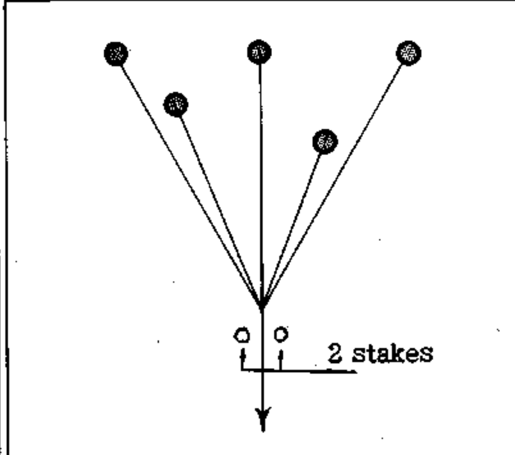


FIG. 2

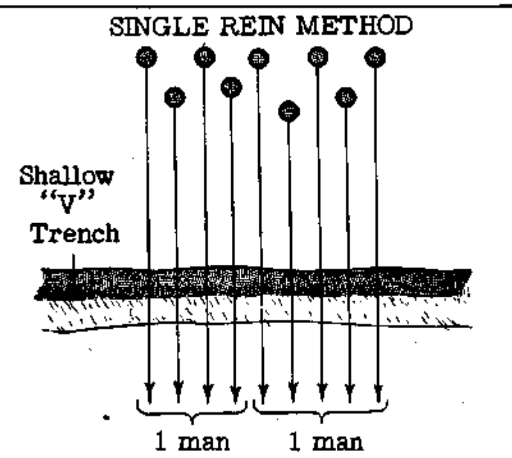


FIG. 3

c. Single Rein Method

This method was quite successful, even over rough ground. One man controls two or three and, over good ground, possibly four separate reins, which are made up of old signal cable (see figure 3).

The mines are pulled into a shallow V-shaped trench from a distance of about 100 yards. The initiating charge is similar to that in method No. 1.

It was found that blowing up in dumps of about 10 was the most convenient

number.

The rate of work: 30 mines per man per day;
The number lifted by the method, 60 to 70,000;
Casualties - nil;
Type of ground, average.

This method was not given fair trial over smooth ground. The rate of work in that type of ground would probably be 40 mines per man per day.

d. Six in One

This method was the quickest over smooth ground. It would undoubtedly have the disadvantages of other methods on rough ground. One man is capable of drawing in six mines at once with the assurance that they will be close together in the pit.

The main cable is 100 yards long and the two shorter lengths about 30 yards, each having a wooden stopper at the end (see figure 4). The six lengths that are

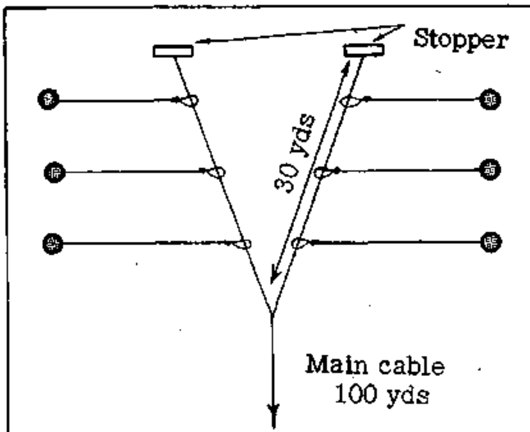
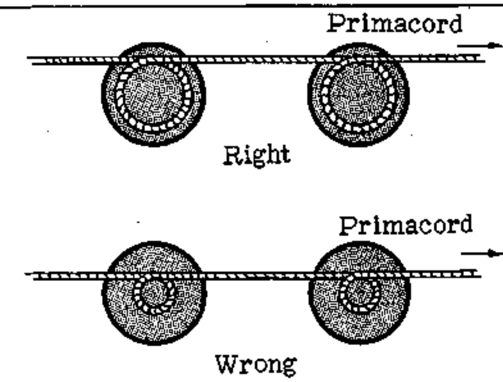


FIG. 4



DESTROYING IN PLACE

FIG. 5

attached to the mines are fastened by making a running loop on the 30 yard lengths. The wooden stopper prevents the loops from slipping off the 30 yard cable.

A suitable arrangement is for the men to work in pairs and draw in 24 mines to each pit.

Initiating charge as in previous methods;
The rate of work, 45 to 50 mines per man per day;
The numbers lifted by the method, 50,000, approximately;

[redacted]

Casualties - nil;
Nature of ground; smooth sand.

e. Destroying in Place

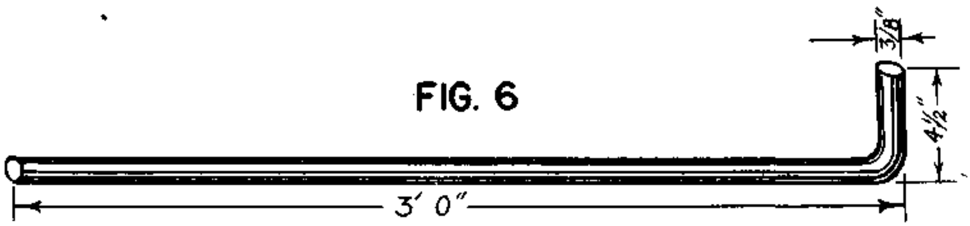
Primacord (instantaneous fuze) is ideal and does not require any subsidiary explosive. A loop on the top of each mine held in place by a stone is sufficient (see figure 5)

One main point, however, is that the loop must be at least 3/4 the diameter of the mine, so that the pressure is towards the outer edge. Failures were reported if the loop was too small.

f. Walking Stick Method

The method of walking through a mined area using a walking stick (also known as the three-legged method) as described below has been used successfully (see figure 6).

FIG. 6



The "stick" is a piece of 3/8" mild steel bar made into an ordinary walking stick with a crook (or straight) handle. It can be used in three ways:-

(a) Swinging - for trip wires
(b) Testing or prodding - for mine-free ground
(c) Swathing by a man crawling.

Swinging - The stick is held vertically, or nearly so, and moved forward just clear of the ground; or, better, held by the crook and swung in the direction of advance. This will detect any trip wires in the orbit of the swing. Great care is not necessary as the force required to fire a pull igniter in this way is considerable.

Testing - The stick is held at an angle of about 45 degrees and used to test the ground for one's next foot print. If the earth feels soft the stick is pushed into it and used as a probe.

In walking through a minefield, the stick is used for swinging and testing in more or less one movement.

If any obstruction is met with, the spot is NOT further investigated (unless on a mine reconnaissance), and another place is tested.

[redacted]

Swathing - A man crawling uses the walking stick held horizontally and flat on the ground. He thus sweeps an arc of ground immediately to his front to detect 3-pronged igniters. The stick can also be used (held half-way down) as a "short arm" prodder.

g. Clearing Antipersonnel Minefield

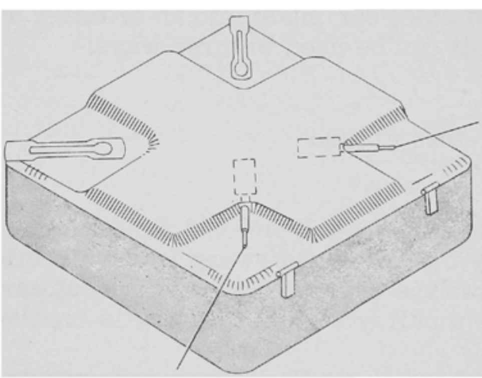
From a recent report on clearing an enemy antipersonnel minefield the following points have been noted.

(a) A careful search with a detector to insure 100 per cent clearance is necessary.

(b) Engineers checked one field where they found two mines overlooked by the infantry who had already reported the area clear.

11. GERMAN IMPROVISED MINE

The Tellermine carrying box has been found equipped as an improvised mine. A description and sketch follow.



The charge in a mine examined consisted of a Tellermine box filled with flaked TNT and odd bits of iron, such as nails, bolts and nuts. One box had bits of an "S" mine in it. The igniter assembly consisted of two pull igniters (standard German type) screwed into 6" x 1" stick TNT charges which were in the top of the case. The inner corners of the recessed portion of the lid were roughly drilled to allow the whole igniter to be inserted in the TNT block at an angle of 20° to the horizontal. The igniter was fixed to a low trip wire and was retained to the case by the small charge into which it was screwed.

The German Tellermine is widely used against tanks and other vehicles. To date, four different versions of this mine have been encountered. Teller is the German word for "plate" and is intended to suggest the appearance of the mine.

[redacted] [redacted]

INFANTRY

12. SOME BASIC TACTICS OF THE JAPANESE

A review of the operations of the Japanese so far in this war shows that they have stressed the indoctrination of an almost fanatical spirit of self-sacrifice; the wide use of deception; and emphasized speed, surprise, mobility, and offensive action. From almost every fighting front in the Pacific there have come reports that it has been necessary to completely wipe out all Japanese opposition before the objective could be attained. The following examples taken from a British source are illustrative of some basic Japanese tactics.

*   *   *

"When I received my mobilization orders, I had already sacrificed my life for my country......you must not expect me to return alive." This sentence is quoted from a letter found on the body of a dead conscript. It is by no means exceptional and indicates a fanatical conception of service which finds expression in a disregard for personal safety and a readiness to fight to the last man and the last round. The morale from which such feelings of self-sacrifice spring, is based on an attitude of mind assiduously cultivated from a very early age.

Japanese moral training instils a strong religious belief; "Comrades who have fallen," reads what is almost the last entry in a soldier's diary, "soon we shall be fighting our last fight to avenge you, and all of us together, singing a battle song, will march to Kudan." (Kudan is a shrine in Tokyo dedicated to the war dead). The second pillar of Japanese morale is deep personal devotion to the Emperor. The last blood-smeared page of a diary captured in Burma has "Three cheers for the Emperor" scrawled across it. The army belongs to the Emperor and its mission is his divine will. Finally, the Japanese believe they are a chosen people, and a superior race. Such is the basis of a morale to which is closely allied a high state of individual and collective battle discipline.

All this does not mean that the Japanese are immune from fear and defeat. Even now when the main United Nations effort is still confined to Europe and the situation is more favorable to the Japanese than it may ever be again, we find that the desire for self preservation can, at times, be stronger than the desire to stay and fight it out. A statement by a Japanese captured in the Arakan is worthy of note. He volunteered the information that our shelling and bombing had caused, besides shell shock, several cases of nervous prostration.

Japanese tactics in general are based on deception and rapid maneuver. They will go to extremes to create false impressions. Sheer weight of numbers and steam-roller tactics are apparently distasteful to them, as such tactics lack finesse, though they would probably be used if required. One gets the impression that the perfect solution to a tactical problem is a neatly performed stratagem, followed by an encirclement or a flanking attack driven home with the bayonet. This allows the commanders to demonstrate their ability, and the men to show their courage and ferocity in hand-to-hand fighting. Their plans are a mixture of military

[redacted]

artistry and vain-glorious audacity.

Deception, strategems and ruses must be expected at all times. Bulldog tenacity in carrying out a mission, even to annihilation, will very frequently give a most erroneous impression of the Japanese strength and will often result in small forces overcoming larger ones, as their units are not rendered ineffective until they are nearly all casualties.

This capacity for driving on despite losses is not displayed by officers only. Training for the Japanese has been so thorough that every man will keep plugging until his own part of the main mission is completed. Long experience has taught even the privates what must be done before a mission is completed, and discipline, lack of imagination, and fatalism, drives them on despite losses.

To the Japanese leader, tactics is an art, with decisions gained by skill, not by sheer power. Training and the delegation to subordinates of the initiative for independent action are most probably the factors that make such tactics simple.

The Japanese attempt to achieve surprise both in strategy and tactics and ruses are extensively employed.

Approaches through country regarded as impassable and the conduct of operations during foul weather are means by which troops more sensitive to ground and climate have been placed at a disadvantage. The fifth column has been freely employed, and with its aid it has been possible greatly to increase the methods by which the enemy can be taken by surprise.

Ruses include the use of disguises, calling out in the language of opposing troops, feigning panic, disorganized withdrawal, and the use of captured uniforms and native clothing. Disorganized withdrawal may be accompanied by strewing the line of withdrawal with supplies and equipment--all carefully covered by concealed machine guns.

Mobility, which is achieved in a number of ways, has been one of the most important factors in obtaining surprise. The ability to exploit to the full the exceptional marching powers of the troops--they are capable of covering thirty or more miles per day--is closely allied with the question of rations. They may, by choosing a circuitous path through difficult country, attempt to overtake and cut the line of retreat of a force withdrawing along a road, but mobility does not end there; if the chances of living off the country are small, troops may carry as much as seven days' rations with them, thus freeing themselves during this period from the encumbrance of an administrative tail. Impressed local inhabitants, with carts or boats, if the country is suitable, supplement their carrying powers, while opportunities to seize local supplies are never neglected.

The Japanese soldier has been trained to carry up to 58 pounds which is what Napoleon's troops carried when they marched to Moscow--but the total load of the French included 15 days' rations. Lest either of these loads should be thought exceptional, we should not forget that the British troops in the Peninsular War

carried about 60 pounds and those at Mons in 1914 carried only a few pounds less.

It should on no account be construed from this paragraph that the Japanese habitually carries a heavy load of rations and equipment, for like us he prefers to fight as lightly equipped as possible; but the point worthy of note is that if several days' mobility can be achieved c[illegible]e price of carrying a load of rations on his back, he is prepared to carry [illegible]

Offensive action has been described as a principle which gives moral superiority, tends to confer the initiative, and, with it, liberty of action. The Japanese interpretation applies the principle of offensive action not only to his attacks but also to situations in which his defeat is a foregone conclusion. Whatever the situation, his object is to kill the enemy. "If only I can die killing six or seven of the enemy instead of by his first onslaught"-writes a soldier just before the last attack is made by a small party.

In August 1942 American marines raided an island held by about 90 Japanese. The raid was a complete success and most of the garrison were annihilated. The remnant, however, estimated at about a dozen, attacked the raiding party as it was leaving the island and thus suffered further casualties. It is an interesting example of offensive action in desperate circumstances.

An outstanding example of strategic mobility on the part of the Japanese was their advance through the Shan States from Karenni in the south to Myitkyina in the north, a distance of some 450 miles, covered in three weeks. This feat is even more remarkable when it is realized that during their advance the Japanese fought three heavy engagements and were hindered by numerous delaying actions. The maintenance of a daily average advance of some 21 miles despite delaying actions and having to fight, speaks for itself as an example of strategic mobility. In considering how this advance was achieved the following points are outstanding: First, the skill of the Japanese in the choice, direction and execution of their encircling movements which, probably more than any other single factor, accounted for the speed and great distance of withdrawals the Chinese were compelled to undertake. Second, the refusal on the part of the Japanese to be deterred from the primary objective by threats to flank or rear.

Finally, there is the ability of the Japanese to move without a cumbersome administrative overhead.

13. GERMAN DEFENSIVE TACTICS IN WOODED AND MARSHY COUNTRY

The following description of German defensive tactics on the Eastern Front is taken from an Allied source.

[redacted]

a. Selection of Defensive Positions

In wooded country a highly developed system of artificial obstacles was usually constructed along the outer perimeter of a defended position and machine-gun positions were sited in all defense areas and also along the perimeter.

Defense based on mutual fire support, as well as on the strong system of obstacles covered by fire, allowed battalions to be dispersed over wide frontages and thereby permitted stronger forces to be maintained for the defense of more open country and for tactical reserve.

The Germans, when undertaking the defense of a thickly-wooded position usually cut out of the wood a wide clearing in the shape of an obtuse angle, the apex of which pointed inward towards the defense area. Both sides of the clearing were covered by timber, obstacles, mines, fougasses* and wire (of from two to four strands). These clearings were patrolled day and night.

The main lines of resistance were normally 150 to 200 yards in the rear of the obstacles, their firing points being disposed in depth. Clearings in the form of lanes leading to the flanks were cut out of the wood in order to allow the siting of flanking machine-gun positions.

The forward defended zone was not organized in depth within 1,000 yards of the obstacles. The regimental reserve line was constructed similar to the main line of resistance but with fewer machine-gun positions. Between the main line of resistance and the regimental reserve line, there were double-embrasured fire positions sited in checker-board fashion.

The weakness of such a defensive system lies in the fact that the defender depends entirely on a system of obstacles, whether natural or artificial, and fire points, completely static and vulnerable to flank and night attacks. The Germans, therefore, adopted this static form of defense only in wooded approaches to vital points.

In marshy areas the Germans selected the commanding knolls of dry ground and turned them into defense areas forming a mutually supporting system of such areas. If a knoll could not be incorporated within the defensive system it might become an isolated post.

b. Organization of the Defense

(1) These defense areas might consist of two platoon areas disposed along a front of 1,200 to 1,400 yards with a reserve platoon approximately 1,500 yards in the rear.

If the position of a platoon was not naturally strong, and lacked fire cover, the weakness would be offset by a system of artificial obstacles designed to hinder

*Land mines loaded with broken stones.

[redacted]

attack from the flank and rear. An outpost would be sited so as to protect the flank of the position and the reserve position.

The ground between any two defense areas was covered by fire from both positions forming a sort of pocket into which the Germans would attempt to entice their opponents' advance.

(2) In the open parts of an area, as well as within inhabited places, the German defensive positions were marked by the usual system of timber and earth fortifications and considerable concentrations of fire power. Within 100 to 150 yards of the main line of resistance pickets armed with sub-machine guns, were posted in pairs. At night, the whole area was patrolled. The main line of resistence was usually covered by wire placed between minefields. In the rear of the minefields slit trenches were dug and behind them were machine-gun emplacements. The machine guns were sited in line or in checker-board fashion with heavy and light machine guns alternating, the distance between them being 50 to 60 yards.

The above description is one of a normal type of defensive position. Such positions were connected by crawl trenches sometimes over a mile long. This permitted the enemy to manoeuver his forces and to bring up his ammunition unobserved. In the event of artillery or mortar fire against his lines he often pulled in the forward troops to shelters constructed in the rear. During the bombardment, the trenches remained manned by observers and the Nos. 1 of the machine-gun detachments. As soon as Russian troops moved forward to the attack the Germans returned to their main line of resistance, using the crawl trenches.

c. Construction of Defensive Positions

(1) Emplacements for both heavy and light machine guns were usually constructed in the shape of the letter W. The width of such an emplacement was from three to four yards, the length four to five yards and few examples were encountered on the northwestern Russian Front of the large quadruple-embrasured machine-gun emplacement. The usual type was a two-embrasured emplacement of light construction, used both for protecting the weapon and as a dug-out for housing the detachment. The dug-out was normally covered by two or three layers of earth, sod and timber, giving a thickness of 16 to 20 inches. Embrasures two feet long and three to six inches deep in the emplacement were cut about 6 to 12 inches from ground level.

(2) Mortar emplacements sited in open areas were also of timber and earth construction, similar to the machine-gun emplacements. In both cases approaches on the forward side were mined.

(3) In wooded and swampy areas, unsuited to tank movement, the Germans made use of shrapnel mines and booby traps, the mines being placed some two yards apart.

The minefields usually were found to have one or two, but seldom three rows, the rows being anywhere from 2 to 15 yards apart. They were found on occasions to

be laid without any regular system in order to make the finding and clearing of them more difficult. Timber and wire obstacles were frequently found to have a single row of mines on the forward side. Land mines and booby traps were often placed in and around wire and felled timber. Antitank and shrapnel mines were frequently found in the immediate vicinity of enemy defense areas. These were arranged so that they could be blown up by the garrison when attacking troops advanced over them. It was common to find that minefields were extended over the front without much depth. German fire-plans often included lanes of some 150 to 250 yards width into which, by employing weak frontal fire, the Germans allowed advance troops to penetrate, whereupon heavy enfilading fire with automatic weapons was brought to bear. Mortars sited in groups of three or four were frequently used. The use of single mortars was limited to roving weapons only. One of the tactics employed was to abandon certain positions and emplacements with little resistance and to enfilade the attacking troops as they approached.

The type of defense detailed above must not be considered as invariable, in that the enemy changed his methods to suit topographical features and the situation at the moment. This applied particularly to instances where the position was known to have been patrolled by Russian troops and is a confirmation of the necessity of carrying out never-ceasing reconnaissance in order to discover in time any changes which have taken place in the defensive positions.

MEDICAL

14. ITALIAN MALARIA PREVENTION

It is reported in an Italian navy circular dated March of this year, that Italchina* is issued to Italian navy personnel as a prophylactic against malaria. It is issued on two consecutive days each week in three doses totalling 30 centigrams. Personnel stationed in central and southern Italy, Corsica, Sardinia, Sicily, Albania, Greece, the Aegean area and North Africa received this prophylactic treatment in the 1 May to 15 November period. Men stationed in northern Italy, Russia and Yugo-Slavia got Italchina pills from 15 May to 31 October. Quinine is only used as a cure and not as a prophylactic against malaria.

15. ARMY MEDICAL CONDITIONS IN NORTH AFRICA

a. General

A very recent article by a British medical observer in North Africa has come to hand, from which the following article has been taken. It is of interest to the non-medical as well as Medical Corps personnel.

*Examination of captured Italian medical supplies, reveals that this is identical with our atabrine.

[redacted]

Among the miscellaneous observations noted was that while lice were well controlled in British and American troops, 20 to 25 percent of the captured German troops and practically all the natives were lousy. As lice carry the dangerous typhus fever, the freedom of Allied troops from the vermin is commendable. Venereal disease rates in both British and American forces were unexpectedly low. Dysentery, which might have been expected in Africa, was likewise not severe. Malaria infection has not yet become a serious problem, but more is expected as the rainy season advances. Among British and American troops, no tetanus was observed, a remarkable tribute to the antitetanus vaccination, but captured German personnel suffered from it. Gas gangrene, which haunted the hospitals in France during the First World War, has been cut to 51 cases and 13 deaths in from 10,000 to 12,000 wounded. Here it will be noted that North Africa is a country where gas gangrene is to be looked for, at least in the cultivated areas.

The incidence of psychoneurotic cases among the American forces was high, especially where connected with extreme fatigue and nervous exhaustion. Some appeared to be caused by blast injuries (shell shock). Most of these were treated in the forward areas and returned to duty.

b. German Field Evacuation of Casualties

Forward field evacuation of the German forces seems to be handled similarly to that in the American Army, there being company first aid men and stretcher bearers. A German division consists of three regiments and contains one or two medical companies (Sanitatskompanie) which are similar to the British field ambulance organization. Each of these two organizations consists of eight doctors, who in the German Army are not given military rank, and 180* medical department soldiers. Each company was broken down into a headquarters and two other sections. Each section was prepared to perform surgical operations and had a surgeon attached to it. One X-ray unit per divison was furnished. An ophthalmologist was also occasionally attached to a company. The use of the personnel of this organization does not seem to have been stereotyped but was subject to variation as the situation demanded.

There was a regimental aid post near the front lines and evacuation to the rear was direct by ambulance. The next step in the chain of evacuation was Feldlazarett (field hospital) with a normal capacity of 200 beds. This hospital was staffed by eight doctors, of whom three were surgeons; 200* enlisted men were attached. Further to the rear was found a Kreigslazarett (probably evacuation hospital) with a bed capacity of 400 and capable of expanision to 700. During the North African campaign no hospitals of larger capacities were to be found behind the German lines. Evacuation of casualties from the Kreigslazarett was by air to the Mediterranean Islands or to Italy. Following air supremacy by the Allies evacuation of patients by air became difficult and the German hospitals were greatly crowded.

*These figures do not correspond to other reports on the organizational strength of these units.

[redacted]

On the whole in the last phases of the North African campaign the wounds seen in captured German soldiers were more severe than those experienced by our own men. Mortar fire seemed to produce particularly severe types of wounds. The severer German casualties were attributed to superiority in artillery fire and air attack by the Allies.

ORDNANCE

16. GERMAN 200-MM SPIGOT MORTAR

The German 200-mm (7.9 in) spigot mortar leichte Ladungswerfer 40 is an engineer weapon, intended for use against minefields, wire, antitank obstacles, and weapon emplacements. It is of normal spigot design, the propellant case being attached to the top of the spigot before the bomb is loaded. Fixed ammunition is not used. The 200-mm spigot mortar bomb was described in Tactical and Technical Trends No. 16, page 32.

The following additional information as to the mortar itself with accompanying sketch have recently been received from a British source.

*   *   *

a. General Description

Total weight in action	205 lb
Weight of bipod	43 lb
Weight of spigot and supporting arm	73 1/2 lb
Weight of base plate	84 lb
Length of spigot	21.15 in
Diameter of spigot	3.5 in
System of operation	Bomb electrically fired from spigot
Range	766 yards max. with 46 lb HE bomb
Sight	Dial sight (Richtaufsatz 39)
Transport	Hand cart

b. Ammunition

The 46 pound HE bomb (200-mm Wurfgranate 40), a smoke bomb (200-mm Wurfgranate 40 Nb), and "harpoon projectiles" are fired. The harpoon rounds are said to be used to project cords by means of which mines or a network of charges can be drawn onto dead ground.

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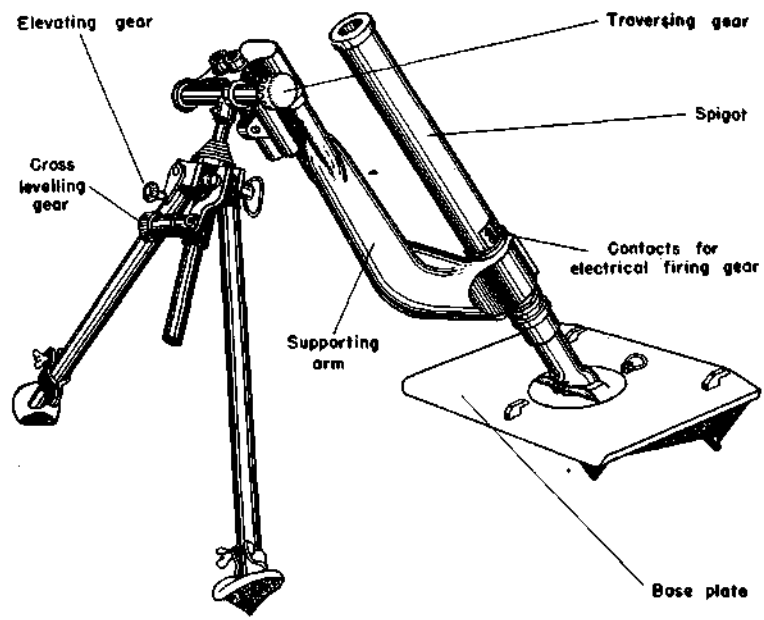
c. The Equipment

This consists of a base plate, bipod mounting and spigot with supporting arm.



GERMAN 200-MM SPIGOT MORTAR

(1) The base plate is of the familiar German mortar design, the bottom being formed with strengthening webs and spikes.

(2) The bipod mounting is similar in construction to that of the 80-mm and 100-mm German mortars, the recoil arrangements however being of a more substantial nature.

(3) The spigot consists of a drawn steel tube reduced at its lower end and screw-threaded externally to receive the supporting arm and base piece. It is bored transversely at its lower end to receive contact pieces and insulation for the electrical firing mechanism.

A T-shaped contact tube is carried from these contact pieces up the inside of the spigot and is maintained centrally by an insulating spacing washer at the front end.

The front end of the spigot is closed by a screw plug which is bored centrally to house a contact plug and insulating bushes, and also houses the firing needle and spring. The front face is prepared with an undercut groove to form a

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bayonet joint when the cartridge is placed in position.

(4) The base piece screws on to the spigot and is formed with a ball at the rear end to engage in the socket of the base plate.

(5) The supporting arm is tubular and elbow shaped. The rear end is formed with a boss which is bored to receive the spigot, the front end is solid and is screw-threaded to receive a collar for positioning in the cradle.

GENERAL

17. FIELD NOTES ON SICILIAN AND AFRICAN OPERATIONS

An officer returning from the Sicilian operations reports that extensive use was made of pill boxes designed to resemble such ordinary road-side structures as houses and filling stations. These were usually found at road bends, where two fire lanes could be covered, and contained machine guns and antitank weapons. It was a most successful camouflage.

The triangular yellow pennant bearing a black skull and cross bones hanging from a light steel support stuck in the ground, was described in Tactical and Technical Trends No. 24, page 11 as a gas contamination warning. In Sicily its appearance was associated with the presence of booby traps.

South of Mateur in Tunisia, the same officer reported the presence of rough cast-aluminum mines resembling tellermines. It is hoped that an accurate description of these mines will shortly be available, as they appear to be made in the field of salvaged materials, and may be met with in Europe.

In a German battalion-strength hill defense position that put up a particularly stiff resistance, the machine guns and antitank weapons were sited with their muzzles barely clear of the ground along the crest. Behind the crest were deep dug-outs and trench positions to which the garrison retired during bombardment.

German powder is practically smokeless, but does flash at night. The 88-mm guns give no smoke, and on one occasion, held up a tank attack all day, till, at dusk light tanks were sent out to draw fire, and the guns were located by their flash.

He remarked upon the successful use of a 110-foot span steel Bailey bridge triple truss, single story, which during the Sicilian operations, had to be emplaced over a deep gorge at a hairpin turn. In spite of the turn, the bridge was placed by means of a counterweighted end.

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18. THE STING RAY OR STINGAREE

While American troops are fairly well acquainted with the vicious habits of the shark and barracuda, other varieties of dangerous fish exist in far greater numbers in S. W. Pacific waters, where even the coral can cause poisoned cuts. Many of these warm-water fish are capable of giving venomous stings, and are far more likely to be encountered by troops in operations along the shore, than the barracuda or shark. Among them are the stone-fish and scorpion-fish, small to moderate-sized denizens of coral reefs; the weever, a reef fish resembling a sea-bass, but equipped with venomous spines upon its head; numerous sea-urchins, animated pin cushions that live among stone and coral, which are capable of giving severe stings if touched, or disabling, poisoned wounds if trodden upon. In shallow water, on both sandy and mud bottoms lurks the sting ray, see figure 1.

The authoritative magazine, Natural History, published by the American Museum of Natural History, New York City, recently referred to the sting ray or stingaree, as the "rattlesnake of the sea." A small specimen, perhaps a foot in length exclusive of the whip-like tail, is capable of sending a man to the hospital; a 200-pound ray can kill a man. Dr. Leonard P. Schultz, Curator of Fishes, U.S. National Museum, to whom we are indebted for the following timely article, stated that, on the mud-flats of a tropical river at low tide, he had seen sting rays, large and small, lying as thickly as one per square rod. Such a congregation of highly venomous fish constituted--to use Dr. Schultz's expression--a mine field. As casualties have already occurred among our forces from ray stings, the following article may well be of value to officers whose commands are assigned to areas where these fish occur.

* * *

In general, many people and some uninformed naturalists have the opinion that sting ray or stingarees do not have a poisonous sting. However, those of us who have studied these fishes and have had personal experience with them, are certain that the "sting" is highly venomous. Before I cite one or more cases of persons who have been jabbed by the spine of a sting ray, I shall attempt to acquaint the reader with these fishes and the nature of their sting or spines.

The stingaree is one of the rays, a fish related to the sharks and greatly resembling them in structure. In shape, however, the rays are flattened and disk-shaped, and have a long tail. The rays that bear a long sharp spine, usually in the middle upper part of the tail, are known as sting rays, a word corrupted to stingaree.

Several dozen different species of sting rays are known to science. These creatures occur in all warm seas, and in adjoining brackish waters as well as in many of the tropical rivers, some freshwater sting rays in South America even occurring more than a thousand miles above the river mouth. A few freshwater sting rays occur in the S. W. Pacific area, in very shallow water. Wherever sting rays occur - in the seas, bays, or in rivers - they are to be found hiding on the bottom in mud or sand. If disturbed, they swim with an undulating motion, usually close to the bottom, and stir up a cloud of mud, then come to rest on the bottom,

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the muddy cloud gradually settling around the ray. This "mud cloud" and the camouflaged coloration of the fish itself, serves a definite purpose in concealing it. While thus partly buried in the sand or mud bottom, the sting ray is in perfect readiness to drive its sting into any unsuspecting victim who might inadvertently step on it. The weight of a person stepping on the disk-shaped part of the body anchors the sting ray, giving it the needed leverage to whip its tail upward with uncanny precision and drive the already erected spine or sting into its target. The sting, on the powerful tail of even a small ray only a foot across in size, can pass through one's foot or into the bone of the leg.

Figure 2 (see p. 38) shows the sting or spine clearly with the barbs along the sides and the groove near the base of these spines. Dr. H. M. Evans of the Lowestoft Hospital, England, who made an extensive study of the sting ray, found that the poison gland of the fish occurs in this groove. The barbs tear a jagged wound and if the sting breaks off, it invariably has to be pushed on through or dissected out by a doctor. J. Vellard carried out experiments injecting the venom from the glands of South American freshwater sting rays in various animals, and in several instances death occurred in a few minutes.

Now that the reader is familiar with the habits of the stingaree and the structure of its sting, I would like to cite a few cases to illustrate why fishermen and bathers have great fear of this demon of the beaches, bays, and rivers of the tropics.

During 1942, my assistant, Rafael Navarro and I were collecting fishes for the United States National Museum in a swamp north of Sinamaica, Maracaibo Basin, Venezuela. We had walked nearly half a mile across this shallow muddy mire, pushing a small boat (cayuco) in front of us. Along the way, we noticed many sting rays measuring in size up to a foot across their disks. The water was from a few inches to a foot deep and our feet sank as far in the soft muddy bottom. We made a fair collection of the various kinds of fishes present and started back. I urged my assistant not to pick up his feet in this mud but to push them forward at the surface so that he would not step on one of these sting rays, as they lie slightly imbedded in the upper layer of the mud. If you touch one with your foot it wiggles off, but if you set your foot upon it, this gives the little demon the needed leverage for driving its sting, which is one or two inches long, into your foot or leg with terrific force.

On the way, I heard Navarro cry out in agony. A stingaree had driven its spine into his ankle, but fortunately the spine did not break off. My assistant was in terrible pain, jumped around wildly, and then lighted a match to stick into the wound. At this point I knocked the match from his hand and forcibly shoved him into the boat. Although my Spanish was not good, I made him understand that he should let the wound alone. It bled some and he was very excited. He tried to put a torniquet around the upper part of his leg to stop the flow of blood, but I observed that it was not arterial blood and made him take the band off and let the wound bleed freely for a few minutes, hoping to cleanse it of the venom. When we reached shore, I got out my first aid kit and cleaned the wound, swabbing it out with iodine (for lack of something better), and then bandaged it. Navarro said the iodine hurt

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almost as much as the sting. At camp that night, I found the wound was about an inch deep, clear to the bone, but showing no special swelling. I then washed it off, put on a larger bandage saturated with one percent metaphen, and after a week of this treatment, the sore was completely healed.

These freshwater sting rays are mere babies compared with the big ones in the warm seas of the world. One species, the giant stingaree of Australia, reaches a length of over 14 feet and a weight of at least 750 pounds. The sting in such a large fellow is usually a foot long. One can well imagine what a terrible thing it would be to have such a stingaree jab its sting through one's leg. Evidence from fishermen around Europe indicates that the venom of stingarees in the adjacent seas is most severe, its action not greatly different from that of cobras. Dr. Lo Bianco saw a young man become extremely pale and fall down almost senseless for a few minutes after having received only a very small puncture from the sting ray called Trygon. Another physician relates the case of a colonist of Demerara, British Guiana, who died in violent convulsions, and of the two Indians who accompanied him, who, wounded in the feet, became seriously ill and recovered the use of their feet only after a long period of suffering. The same physician continues: "Along the China coast, a twenty year old Chinese was wounded in the thigh. He fainted and, on regaining consciousness, had complete numbness and paralysis of the limb affected."

These few accounts, and others that I know of which have happened to acquaintances of mine, definitely verify the extreme virulent nature of the venom injected by the sting of the stingaree. Besides the venom, bacteria may enter the wound and infection set in, which has been known to result in death of the victim.

How to Avoid Stepping on a Stingaree

Since all stingarees hide, partly buried, in the mud or sand of the bottom, they are always a potential danger to all who wade over such bottoms in tropical seas or in certain tropical rivers. The chief hazard is to step on one of these fishes. This is almost completely eliminated by scuffling your feet along the bottom in the upper layer of mud or sand. The moment something touches the ray, it wiggles off. In addition, it would be advisable to carry a pole and probe the bottom in front of you as you walk forward. Remember the stingaree may occur in water only a few inches deep.

How to Treat the Wound Made by the Stingaree

For treatment of the wound made by the sting ray or other venomous fishes, I quote Dr. H. M. Evans. "From practical experience, I have come to the conclusion that the most useful method is to inject into the puncture 0.5 cc of 5 per cent solution of permanganate of potash. Two patients I treated in this way, having been stung by the lesser weever in the foot, had immediate relief from pain and were able to walk away from my house in perfect comfort, and no inflammation or gangrene resulted. For the resulting inflammation in untreated cases, cooling lotions or hot fomentations must be applied."

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No doubt some bleeding is beneficial as it may wash out some of the venom left by the sting. Iodine has been found useful also, in the treatment of such wounds.

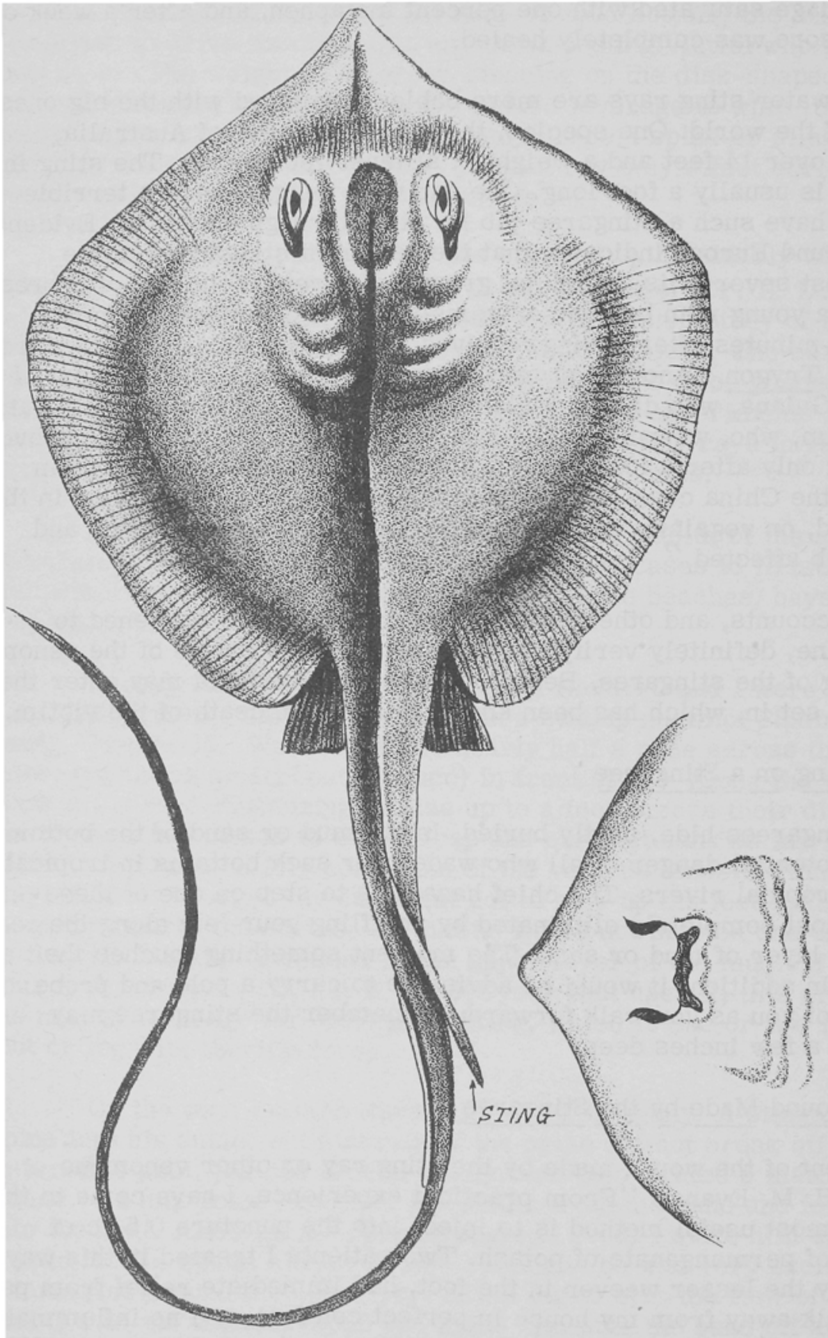

FIG. 1

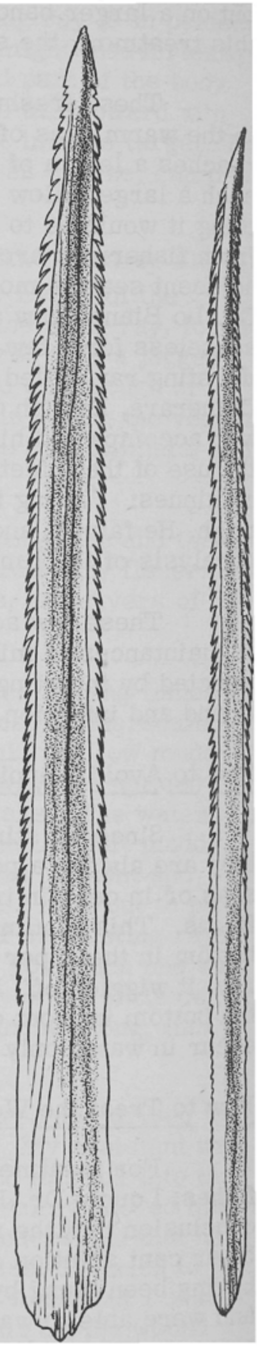

FIG. 2

SECTION II

THE ECONOMIC ORGANIZATION OF THE GERMAN ARMY

THE ECONOMIC ORGANIZATION OF THE GERMAN ARMY

Introduction

The German Wehrmacht has displayed a clear understanding of the importance of economic factors in modern warfare and has attempted successfully to apply this understanding in the practical sphere of operations.

The importance of economic factors in influencing the outcome of a modern war was driven home to the German armed forces by the events of the First World War. German post-war military doctrine blamed the outcome of the First World War in large part on the failure of Germany to prepare in advanc for a long, industrial-type war. A substantial section of influential military opinion held that the economic factor was decisive in Germany's losing the war. The war of attrition that developed after the First Battle of the Marne found Germany unable in the long-run to match the production potential of the Allied Powers. Germany's failure to build up large stockpiles of essential imported raw materials, expand domestic food production, arrange for an orderly shift from peacetime to wartime production, devise an efficient rationing system, and develop plans for the incorporation of the economy of the occupied nations into the German economy meant that it was forced to improvise in the economic sphere.

Although Germany's economic efforts in 1914-1918 compared favorably with those of the Allied Powers, its initial failures meant that it forfeited its only real opportunity to offset its inferior resources by a more effective and prompter economic mobilization. The greatest single blow to the Central Powers came with the entry of the United States into the war. It was the unexpectedly prompt harnessing of the American production potential and the near exhaustion of the limited German potential that was in large part responsible for the final military collapse of Germany.

The significance of the American effort was not lost upon the German military leaders. The post-war army leaders were determined to avoid the economic mistakes of the First World War. The failure to carry out effective mobilization in the pre-war period was blamed largely on the inability of the German military and civilian authorities to grasp the potential importance of economic factors in determining the outcome of the war. The logical answer to avoiding repetition of this experience was to secure within the armed forces a body of officer personnel competent to cope with the problems of economic mobilization. This procedure would overcome the major weakness of the pre-World War I military personnel in the economic sphere, which was the lack of interest in, and an understanding of, economic problems on the part of the General Staff. This lack of interest meant that the military failed to play a decisive role

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in formulating economic mobilization plans and failed to exercise a general supervision over the economy sufficient to ensure an adequate arms production and sustained powers of resistance over an indefinite period.

Preliminary Military-Economic Research

Out of the First World War experience, then, a German military doctrine as to the proper role of the military in a war economy arose. The essential element of the doctrine was that representatives of the armed forces should assume authority for the over-all planning of economic mobilization and the coordination of the military and civilian phases of the economy.

The first actual step taken in the post-war period was the undertaking of a careful study of the experiences of the first war in the Historical Section of the General Staff, camouflaged as a section of the Reichsarchiv. The economic studies were published as a series, Kriegrustung und Kriegswirtschaft (War Armament and War Economy). Two volumes, dealing with the pre-World War I experience were published by 1930, while the other volume, dealing with World War I economic mobilization, was kept secret. These studies contained the blueprints and drawings for the mass production of armaments under the Hindenburg program of 1916.

Shortly after the establishment of the Historical Section, a small economic section devoted to the preparation of economic mobilization plans was established within the Heereswaffenamt (Arms Office, i.e., Ordnance Department) of the Reichswehr. This section was called the Nachschubstab (Supply Staff) and was a part of the Testing Division of the Ordnance Department. As early as 1926, the Nachschubstab began to place officer-economists with the various corps area commands (Wehrkreiskommandos) for the purpose of exploring quietly the armament potential of the districts to which they were assigned. At the same time, the first attempts were made to interest certain leaders of industry in economic mobilization problems. At the instance of the Heereswaffenamt a committee of industrialists, disguised behind the name of Statistical Society, was created under the chairmanship of Privy Councilor von Borsig.

Preliminary Organization

The officers first engaged in the economic studies and planning were largely outside the 100,000 men permitted the Reichswehr under the Versailles Treaty. They were men who had studied engineering and technology as part of their military education and who, but for their camouflaged employment, would have had to remain in the private businesses to which demobilization had sent them.

The need for additional officers specially trained for the economic phase of modern warfare, and particularly younger officers for field-inspection work, soon became apparent. A small but steadily increasing number of officers on the active list were therefore sent to study engineering and economics in various technical institutes.

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The use of non-military institutions was necessary because the military academies had been abolished under the Versailles Treaty. The chief place of study was the Technical Institute at Berlin-Charlottenburg. The emphasis in the training was upon industrial engineering problems such as production management in armament factories, problems of standardization, control of raw material flows, and rational use of manpower.

The training of the officers included at least one year of practical work in factories and other production plants and numerous inspection trips to mines, factories, and producing and fabricating centers.

Upon this pioneer work of the Reichswehr, the Third Reich proceeded to build an elaborate system of military control of economic mobilization. In 1933 a new body, the Wehrwirtschaftsstab (War Economy Staff) was instituted under the leadership of Colonel Georg Thomas and with a small staff recruited from the officer-economists trained in the 1920's. The Wehrwirtschaftsstab represented the direct successor to the Nachschubstab of the Ordnance Department.

Working Organization - The WiRü

The Wehrwirtschafts und Rüstungsamt im Oberkommando der Wehrmacht (War Economy and Armament Office of the High Command of the Armed Forces)

The Wehrwirtschaftsstab functioned under the control of the High Command of the Armed Forces as the key economic organization of the Wehrmacht. From 1933 until 1938, command of the Armed Forces was exercised by the Wehrmachtamt (Armed Forces Office), a special office in the Reich War Ministry (Kriegsministerium) composed of representatives of the Army, Navy, and Air Force.

In 1938 the Oberkommando der Wehrmacht (High Command of the Armed Forces) took the place of both the old War Ministry and the Wehrmachtamt. As a part of the general reorganization, the name of the Wehrwirtschaftsstab was changed to Wehrwirtschafts und Rüstungsamt (WiRü). Under Colonel Thomas, later promoted to general, this economic staff remained under the supervision of the High Command of the Armed Forces as before and was composed of representatives of the three services.

The principal duty of the Wehrwirstschaftsstab-WiRü was to plan the mobilization of the German war economy. This involved the WiRü in a thoroughgoing examination of German resources and the preparation of detailed plans for the conversion of German industry into armament production.

(a) Mobilization Plans

The formulation of mobilization plans by the WiRü involved it in policy decisions on a variety of important questions, such as the distribution and accumulation of raw materials, conversion of existing plant facilities, location of the armament industry, personnel requirements of the new armament industry, broad principles of price and wage policy, and regulations governing the administration of the Wehwirtschaft.

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The scope of the activities that had to be undertaken by the WiRü in preparing its mobilization is indicated by its organizational structure, the WiRü being divided into four branches:

War Economics Division
Armaments Economics Division
Raw Materials Division
Price and Contracts Examination Division

This phase of the work of the WiRü was analogous to the economic mobilization planning activities of the United States Army-Navy Munitions Board in the same period. In contrast to subsequent developments in the United States, however, the program planned by the WiRü was followed by the German Government.

(b) Implementation

The implementation of the broad plans developed by this military body was carried out by a variety of governmental departments, largely civilian. In 1936, when the Four Year Plan was introduced, the Office of the Four Year Plan, under Göring, received supreme authority for the subsequent reorganization of the German economy and the WiRü nominally functioned under directives from this Office. However, this development created apparent rather than actual overlapping of functions. Colonel General Thomas (promoted to General der Infanterie in 1940), Chief of the WiRü, was one of the organizers of the Four Year Plan, and the WiRü continued its operations undisturbed.

(c) Supervision of Armaments Industry

Although the WiRü was primarily a planning group, it acquired more and more administrative functions as the German economy shifted onto a highly mobilized basis. The most important of these functions revolved about the supervision of the German armaments industry. Armaments inspectorates were established, first in every corps area (Wehrkreis), and later in smaller districts. Each corps area inspectorate was placed under a Rüstungsinspektor, whose rank varied from colonel to major general, depending on the industrial importance of the Wehrkreis, and who was chosen from any of the three branches of the armed forces. This officer was successor to the economic officer of the Reichswehr but had far more power. His primary function was to serve as counsellor on all economic questions involving the needs of national defense. This involved supervision of all armaments and related plants in the district. The inspectorate staff undertook detailed studies of available industrial capacity in their districts and made recommendations on such matters as the establishment of new plants, conversion of existing plant facilities into armament production, and shift of old plants to safer areas.

The field inspection system of the WiRü became increasingly important as the bulk of German industry shifted into war production. This development moreover involved the WiRü in a number of very important new functions, most

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important of which was the coordination of the military requirements schedules submitted by the Army, Navy, and Air Force with the available supply of labor, raw materials, and capital equipment.

(d) The WiRü Subdivided

The system as developed in the pre-September 1939 period lasted without important modification until May 30, 1942, when the WiRü was split into two branches. The Rüstungsamt (Armament Office) was transferred to the Ministry of Armaments and Munitions under Speer. The Wehrwirtschaftsamt (War Economy Office) remains under the Oberkommando but some of its officer personnel are subject to Speer's orders as well.

The splitting up of the WiRü meant a definite curtailment of military authority over the German economy. There are several explanations for the action undertaken on May 30, 1942. In the first place the 1941 Eastern Campaign had revealed certain defects in the existing system--duplications and overlapping of authority, a mounting volume of paper work, administrative bottlenecks, etc. In the second place, the curtailment of military authority fitted in with the current policy of concentrating power more and more into the hands of trusted Nazis. Under the reorganization, final reconciliation between civilian and military requirements was taken out of the hands of the Oberkommando and placed under the control of two leading Nazis: Walther Funk and Albert Speer.

(e) Walther Funk and the War Economy Office

Under the present system demands for war materiel which originate in the various branches of the Armed Forces are first sent to the War Economy Office (Wehrwirtschaftsamt), which sets up a balanced program of requirements. From here the program is transmitted to the Armament Office (Rustungsamt) now a part of the Ministry of Armaments and Munitions, where it is adjusted to the available raw materials and labor supply and the productive capacity of the German economy. This board, therefore, has in effect the power to veto the requests of the War Economy Office and is thus the central directing agency of German arms production.

Supreme command over the civilian branch of the German war economy is exercised by Walther Funk, Minister of Economics and Plenipotentiary for War Economy. Speer, in his capacity of Minister of Armaments and Munitions, exercises similar authority over the military sector. If Speer and Funk fail to agree on fundamental policy, the issue may be carried to Göring as Chairman of the Ministerial Council for Defense of the Reich or even, ultimately, to Hitler. Arbitration of this kind, however, is the exception.

The military requirements program, as formulated by the War Economy Office and modified by the Armament Office, is translated into actual production schedules, usually on a three-month basis, by the Ministry of Armaments and Munitions. The allocation of raw materials to industry is carried out by a special department of this Ministry, organized as a limited-liability company, christened

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the Rüstungskontor.

The determination as to who is to produce and how the war material is to be manufactured is in the hands of the Ministry of Armaments and Munitions and the various German industrial organizations, especially the Main Committees (Hauptausschüsse) and Industrial Rings (Industrieringe). These organizations are represented on the Rüstungsrat (Armament Council), composed of five high army and navy officers and eight industrialists, which serves as an advisory body to the Minister of Armaments and Munitions, Albert Speer.

(f) Speer's Armament Office

The regional administrative organization of the German economy was unaffected by the May 30, 1942 decree. In this sphere also considerable confusion had developed as a result of a multiplicity of regional officials and bodies with ill-defined jurisdictions. Finally on September 17, 1942, after all previous efforts to achieve greater coordination among the regional agencies had failed, Göring established by decree 42 regional armament commissions (Rüstungskommissionen) in the 42 party districts (Gaue).

These armament commissions have complete authority over the agencies represented on them, which comprise all the organs of regional economic control, those of the state and army as well as the self-governing agencies of industry:

(1) Rüstungsinspektor of the Ministry of Armaments and Munitions (frequently the chairman). Also the Wehrwirtschaftsinspektor (who may also be the Rüstunginspektor).

(2) Armaments chairman (Rüstungsobmann) representing the Main Committees and Industrial Rings.

(3) The president of the provincial labor exchange (Landesarbeitsamt) operating under the authority of the Ministry of Labor.

(4) The president of the provincial economic office (Landeswirtschaftsamt), operating under the authority of the Ministry of Economics.

(5) The president of the district economic chamber (Gauwirtschaftskammer) and his economic advisers.

Whenever the need arises, the chairman of the Armament Commission may call in other officials such as the presidents of the regional railway administrations and the managers or leaders of the regional organizations of industry proper. The chairman of each commission is appointed by and is responsible to the Minister of Armaments and Munitions, who can thus control all the regional agencies involved in the execution of the war production program.

One of the important features of the decree of September 17, 1942, was the abandonment of the old corps areas as administrative units in favor of the party

districts (Gaue). Armaments Inspectors are now appointed for each of the 42 Gaue, thus giving the Minister of Munitions the opportunity to appoint "loyal" inspectors and, if necessary, replace the old corps area armaments inspectors.

Field Operations of the WiRü

(1) Economic Troops

In addition to its planning and administrative work, the WiRü functioned as the economic intelligence branch of the Armed Forces. In this connection it undertook in the pre-1939 period detailed studies of the economic resources of the other European countries. Emphasis was placed on the principal tangible resources, such as raw material stockpiles, key mines, public utilities, plant equipment, and readily available foodstuffs, the seizure of which would prove of major usefulness to the German war economy.

The first opportunity of the WiRü to put into practice a system of field organization for the sequestration of important resources came in September 1939. With the German armed forces concentrating on the offensive against Poland and standing on the defensive in the West, it became necessary to abandon temporarily small tracts of land in the Saar. The WiRü was called upon to devise ways and means of withdrawing all of the most useful materiel to safer territory. Since the Saarland ranks next to the Rhineland as the most concentrated industrial district of Germany, this was a difficult assignment.

The task before the WiRü was the equivalent oı carrying out the prompt sequestration and removal of the key resources of a small but highly strategic bit of occupied territory. The WiRü carried out the assignment with efficiency and dispatch. The civilian population was evacuated promptly and three thousand carloads of machinery and supplies were moved into the interior of Germany. The work of evacuation of equipment was carried out by representatives of the WiRü, assisted by three provisional companies--one mining company to take care of the mines and prevent their flooding, one electrical company to protect the essential utilities, and one company for miscellaneous jobs--formed for this particular operation.

Later, when the French Army withdrew from its advanced positions beyond the Maginot Line and, incidentally, failed to carry out the obvious operation of shelling the most important factories and immovable mining and utilities equipment before withdrawing, the WiRü agents immediately assumed responsibility for the restoration of production in the Saarland. Evacuated machinery and supplies were brought back, except in those cases where the new and less exposed location of a particularly strategic ex-Saar plant was believed preferable.

The results achieved by the WiRü in the Saarland were distinctly superior to those of the regular Armed Forces in the Polish campaign. There it was found that the regular troops had destroyed or seriously mishandled much valuable economic materiel and had not tracked down supplies of foodstuffs, raw materials, and finished products ruthlessly enough.

On the basis of this autumn 1939 experience, the Oberkommando delegated to the WiRü the responsibility for extending field assistance to the combat forces on all economic matters. These include the physical task of requisitioning raw materials, finished products, and machinery in newly seized areas and the prompt occupation and restoration of production of the most strategic mines, utilities, and plants in those areas.

In the six months prior to the May 1940 campaign, the WiRü devised an effective program for carrying out the field tasks assigned to it. As a first step, officers from the WiRü were attached to the staff of the G-4, GHQ, and later to the G-4 sections of the various Army (and sometimes Corps) Headquarters. These officers served as liaison with the WiRü, and advised the G-4 on all economic problems.

(2) Special Units

Plans were then drawn up for carrying out the requisitioning of foodstuffs, raw materials, and equipment and the occupation of selected utilities, mines, and industrial plants. A variety of special units were to be used for the purpose. Although secrecy has been preserved as to the actual method of recruitment, the following represents a probable close approximation of the method used.

In setting up these special units, the WiRü undoubtedly approached the groups most experienced in the problems to be confronted, viz., the managers of German mines and plants of types similar to those in the territory to be overrun, and obtained their advice as to the proper methods of seizure and maintenance or evacuation of specified plants and the type and number of technical personnel required to accomplish the objectives. On the basis of such information, the WiRü could prepare tables of organization for the appropriate specialist companies.

It is probable that the activation of these companies was postponed until just prior to hostilities, with the technical personnel lined up weeks beforehand directly from German industry and supplemented at the last minute with regular military personnel for use as operating cadre. It is believed that German engineers who had had previous experience in the districts to be overrun were included in the companies whenever they were available. The specialist units were initially assigned to GHQ, and then reassigned to the particular echelons which were to advance into the sectors in which the previously-designated mines, utilities, and plants were located. The economic staff officers attached to the various commands advised on the proper use of the specialist units, particularly as to when they were to be detached to occupy the economic objectives. Once these objectives were occupied, supervisory control over the units reverted to the WiRü.

A substantial number of such specialist units were apparently used in the 1940 campaign. Particular emphasis was placed in this campaign upon public utilities, mines, and armaments plants. Electrical units were utilized to occupy promptly the local gas, water, and electrical works to ensure that the essential public utilities were maintained or restored. This was deemed of especial importance as a means of facilitating the prompt restoration of industrial activity in

[redacted] [redacted]

the occupied districts. "Mining units" were used to prevent so far as possible damage to, and flooding of, certain highly strategic mines (especially the Lorraine iron ore mines, the coal mines in Northern France, Belgium, and Holland, and the Norwegian molybdenum mines). These mines entered heavily into German calculations as important sources of essential raw materials in which Germany was relatively deficient.

In addition to the specialist units with their predetermined industrial objectives, the WiRü set up special provisioning units for the purpose of requisitioning local foodstuffs and petroleum stocks for the immediate use of the armed forces. Still another group of WiRu units, which followed after the ordinary provisioning units, undertook the sequestration of raw material stocks and movable materiel and equipment.

All the WiRü-controlled units were intended solely for emergency use during the active phases of combat and the first phases of occupation. The more permanent work in the occupied areas was left largely to other units, especially the Bautruppen (construction troops) of the Army, the Technische Nothilfe (Technical emergency corps), and detachments of the Todt Organization,* which worked at times independently and at times under the supervision of the WiRü.

Regional Field Administration of the WiRü

Prior to the 1940 campaigns, the WiRü was apparently scheduled to be used in occupied territories for emergency purposes only, with the more permanent phases of economic conquest being entrusted to the civilian authorities.

The unexpected rapidity of the French military collapse disorganized the plans for a gradual shift from military to civilian economic administration. The limited scope of WiRü operations as originally planned was inadequate to cope with the situation that actually arose. Consequently a regional branch of the WiRü was established in Paris. Although nominally under General von Stülpnagel, the Military Commander in France, this Wehrwirtschafts und Rüstungsstab (War Economy and Armament Staff) was directly responsible to General Thomas.

The War Economy and Armament Staff consisted of four central bodies: Special Security Offices, four Armament Inspectorates, Special Buying Offices, and a Central Order Bureau.

The Special Security Offices (Spezialsicherungsstellen) undertook the initial disarmament of the country. Wirtschaftstruppen were used to requisition the most accessible raw material stockpiles, while special salvage columns (Bergungskolonnen) collected the arms and ammunition of the defeated army. Once these operations were completed, the Special Security Offices ceased to function for the War Economy and Armament Staff and came under the control of the Gestapo.

*For further details of the operation of these organizations see Tactical and Technical Trends No. 30, p. 25.

[redacted]

The most elaborate and important divisions of the Staff were the four Armament Inspectorates, which were responsible for the detailed supervision of the French armament and related industries. The inspectorate staffs of regular WiRü - officer personnel - were assisted in their work by a variety of organizations. In the early phases of the operations, the WiRü economic troop units were used for the purpose. Other organizations also assisted. For example, the Paris Inspectorate was provided initially with organized salvage and wrecking groups as well as engineers and technicians from the O.T. (Todt Organization).

The Special Purchasing Offices were created for the purpose of provisioning the troops engaged in the campaign against Britain.

A Central Order Bureau was established in Paris to assist the War Economy and Armament Staff and the Industrial Section of the Administration for Occupied France (Verwaltungstab). Its personnel was drawn in equal proportion from the WiRü and the Reich Ministry of Economics (civilian). The Bureau was the central office for placing German orders with French industry, all orders above 5,000 Reichsmarks being passed on by it.

Gradually, the bulk of economic activity in Occupied France was left to the Industrial Section of the Administration for Occupied France. The War Economy and Armament Staff increasingly confined its attention to supervision of the industrial production undertaken for German account, leaving the detailed administrative activity to the civilian authorities. The principal explanation for this development is the limited number of officer-economists available; thev were needed in Germany and later in Eastern Europe.

As a result of the successful French experience, elaborate plans were made to use the WiRu in facilitating the economic conquest of Russia. A special Eastern Economics Staff (Wirtschaftsstab Ost) was instituted, and economic staff officers were assigned to the various commands. It was planned to use specialist units on a much larger scale than in France, and in the early phases of the operation this aim was apparently achieved. However, the Soviet policy of carrying off or destroying everything useful to the enemy raised almost insuperable obstacles in the way of effective utilization of the economic troops. The task of rehabilitation became a long-time project involving comprehensive planning and thousands of skilled workers operating under a relatively stable military-civil affairs administration.

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SECTION I

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1. THE ME-410 AIRCRAFT

The Messerschmitt Me-410, recently encountered among German operational aircraft, was predicted to be a development of the Me-210 fighter air plane, with a more powerful engine. This has been verified in a report of three of these aircraft examined in Sicily.

The airframe appears to be approximately the same as the 210, which is a two-place, twin-engine, low-wing monoplane, the wings having a pronounced taper to rounded tips. The slim fuselage has a blunt nose, a humped cockpit inclosure in the forward end, and a large fin and rudder. The tail wheel and landing gear are both retractable, the latter into the engine nacelles. Dive brakes are fitted on the upper and lower wing surfaces, outboard of the engine nacelles. The aircraft has a wing span of 53 feet, 9 inches and a length of 40 feet, 3 inches.

The major apparent difference is found in the engine. The Me-410 is powered with the new Daimler-Benz 603A-2 motors, developed from the DB 601 used in the Me-210 but somewhat larger. Those examined had 12 cylinders rather than the 16 cylinders hitherto thought to be in the 603's. They had inverted "V" liquid-cooled units with no turbo-blower system.

The DB 603 is probably de-rated, as are most of the newer German engines, and estimated performance figures have therefore been made for a de-rated version. The maximum emergency power at 19,000 feet is estimated to be about 1,800 hp with a normal fuel capacity of 608 U.S. gallons. This indicates an estimated maximum speed of 390 to 400 mph at 22,000 feet, with a normal cruising speed of 335 mph and an economical cruising speed of 260 mph. A service ceiling of 33,000 feet and a normal range of about 1,100 miles appears possible.

The armament of the Me-410 was expected to be heavier than that of the 210, which consists of two 20-mm fixed cannon and two 7.9 fixed machine guns located in the forward fuselage, and two 13-mm machine guns firing to the rear, each with a 50° traverse, mounted in blisters on each side of the fuselage just aft of the trailing edge. However, while this proved in general correct, the two 7.9-mm forward machine guns were not actually installed in the aircraft examined and the apertures were blocked off.

The armor in the new aircraft is similar to that of the 210, which is very heavy, varying in thickness from 5 mm to 13 mm and protecting the pilot's seat, cockpit, engine and radiators. There is also bullet-proof glass protection for the radio operator.

The 410 is seen more and more frequently, and is possibly being used as a substitute for the FW-190 as well as replacing the Me-210. There has been some indication that this model may also have been equipped for use as a bomber.

UNCLASSIFIED

2. PROTECTION AGAINST JAPANESE AERIAL BOMBING

There have been reports from almost every front that troops of every nation are seriously affected by aerial bombing; at the same time the reports indicate that the actual casualties from aerial bombing are light. The conclusion seems to be that in the majority of eyewitness accounts of aerial bombing of troop dispositions, the effect of the noise of the bursting bombs on the morale of the troops was much greater than the physical injuries inflicted. The use by the Japanese of noise as a weapon was reported in Tactical and Technical Trends, No. 25, p. 24. The following notes on aerial bombing are taken from an Australian publication.

* * *

The enemy had uninterrupted mastery of the air in Malaya, especially towards the end of the campaign. The actual physical casualties among the troops were very light, though there were psychological casualties.

The reason for the light physical casualties was that in Malaya concealment from air observation was extremely easy and slit trenches gave perfect cover where troop concentrations, motor transport, bivouac areas, headquarters and supply dumps were usually located. The enemy had great difficulty in discovering these targets and they were practically immune from bombing. On occasions, however, the location of these targets was indicated by 5th columnists.

In Malaya on one occasion, a young Japanese soldier personally directed an aeroplane by waving a flag--carried by most Japanese soldiers--towards the object to be bombed. A common sign was the cutting of a swathe of grass or the trampling of a sign in rice fields in the shape of an arrow pointing to the target. White circles on the roadway, made by spilling rice or flour, were frequently used as a signal. Banana leaves were often used, being laid on the road in the shape of an arrow. Laundry and timber have been similarly used. The enemy airmen were quick to notice these signs. At night, lights were used to guide bombers towards their targets. These aids helped the Japanese airmen considerably.

Where no cover from view is available, protection can be obtained by dispersal. In the western desert, thousands of motor transport vehicles and artillery regiments could camp dispersed in the desert unmolested by enemy aircraft which frequently flew overhead. A wide dispersal, leaving a gap of at least 250 yards between vehicles, provided ample protection. In aerial bombing under such conditions, only a lucky hit would do damage, and then only one vehicle could be hit at a time. Transport moving along tree-covered roads in Malaya was immune while intervals of not less than 10 per mile were employed. But over and over again a congestion of even two vehicles brought aerial bombing, frequently with disastrous results. It was a habit of some motor transport drivers whenever enemy aircraft approached to stop their vehicles in the middle of the road and rur for concealment in a neighboring plantation. Drivers of following vehicles banked

[redacted]

up close behind them and also ran for cover. This invited trouble, and the invitation was always accepted.

During operations no vehicle should stop within 150 yards of another vehicle unless well-concealed from air observation. Where troops are unable to obtain concealment, they can make themselves comparatively safe by digging slit trenches. In one small area in Malaya a force so dug in on high ground covering an airfield, though severely bombed, had only one casualty--a man who was running from one slit trench to another. The remainder were not hurt, though many bomb craters extended to within a few feet of the slit trenches. On no occasion in Malaya did aerial bombing cause severe casualties to troops in slit trenches. Troops in the open obtained almost equal immunity if they lay flat on the ground. In other theaters of war the same experience has been noted.

The walls of buildings gave perfect protection against bomb splinters, though a few men have been hurt by falling plaster and debris. The chief danger in buildings is the inclination to herd too many men in the one area so that an unlucky hit on the building will cause a large number of casualties. When headquarters is established in buildings, it is necessary to ensure that the walls are splinter-proof, that the windows and doors are protected against splinters, and that no more men than necessary are allowed to remain at their posts in the building during an air raid.

It has been found that troops rush shelters unnecessarily when enemy aircraft are in the vicinity. The alert signal should be given when enemy aircraft are reported in the area and the alarm, the signal to rush for shelter, should only be given when it is apparent that the enemy intends to bomb the area occupied. Air watchers will soon become discerning and able to distinguish enemy aircraft from our own, and when a bombing of the area is likely.

Though the physical casualties caused by aerial bombs are light when adequate protective measures are adopted, the effect on the morale of troops is still serious. This should not be so with well-trained soldiers. It is the noise of the explosion that has this effect and not the bomb itself. Troops should be taught to ignore the noise. Their panic commences when they rush for cover. They should be discouraged from running madly for the air-raid shelters whenever an enemy airplane is in the vicinity. The steadying voice of an officer who is a good leader should control them and help them to control themselves. It is better that they should suffer a few casualties by walking to cover rather than suffer heavy casualties in morale by running madly and becoming panic stricken. Officers and NCO's should give the men an example by exhibiting coolness. They should control the men both while they are moving to cover and while the bombs are falling. Any officer who is unable to do this should be relieved of his command at once. During the bombing, men should be encouraged to sing and to joke about the noise of the bombs, to do anything and everything that will help them to maintain their self-control.

During training, men should be instructed as to the fewness of casualties from direct bombing when in shelters or lying flat on the ground. They should

be taught to steel themselves against becoming rattled by the deafening noise caused by the explosion of the bomb.

3. GENERAL von ARNIM'S ORDERS FOR GROUND DEPLOYMENT

Under date of 10 April 1943, General von Arnim, Commander-in-Chief of the Axis forces in Africa, issued the observations and order indicated below. As a sensible precaution against aircraft casualties, it is worth consideration. The translation reads as follows:

* * *

On my flight over the new positions today, I found there, and stretching far to the rear, unbelievable sights: vehicles and tents grouped together in very small spaces such as, small woods, narrow, dry stream beds, etc. This must increase the heavy casualties by enemy aircraft.

I order:

(1) Distances between tents must be 100 meters;
(2) Distances between vehicles, 50 meters;
(3) Near a house, only one vehicle may be parked and then only on the shady side;
(4) When stopped on a highway, the distance of 30 meters from vehicle to vehicle must be enforced;
(5) If vehicles are parked already on part of the road, no further parking is allowed, and none will be parked on the opposite side of the road;
(6) When a motor convoy is parked, a traffic post must be set up at a distance of 30 meters in front of, and to the rear, of the column;
(7) Columns must not stop on bridges, curves, or in towns; single vehicles may park on side streets in towns, but not on the main highway.

The traffic posts and patrols must be especially watchful in carrying out the above regulations.

Signed: von Arnim

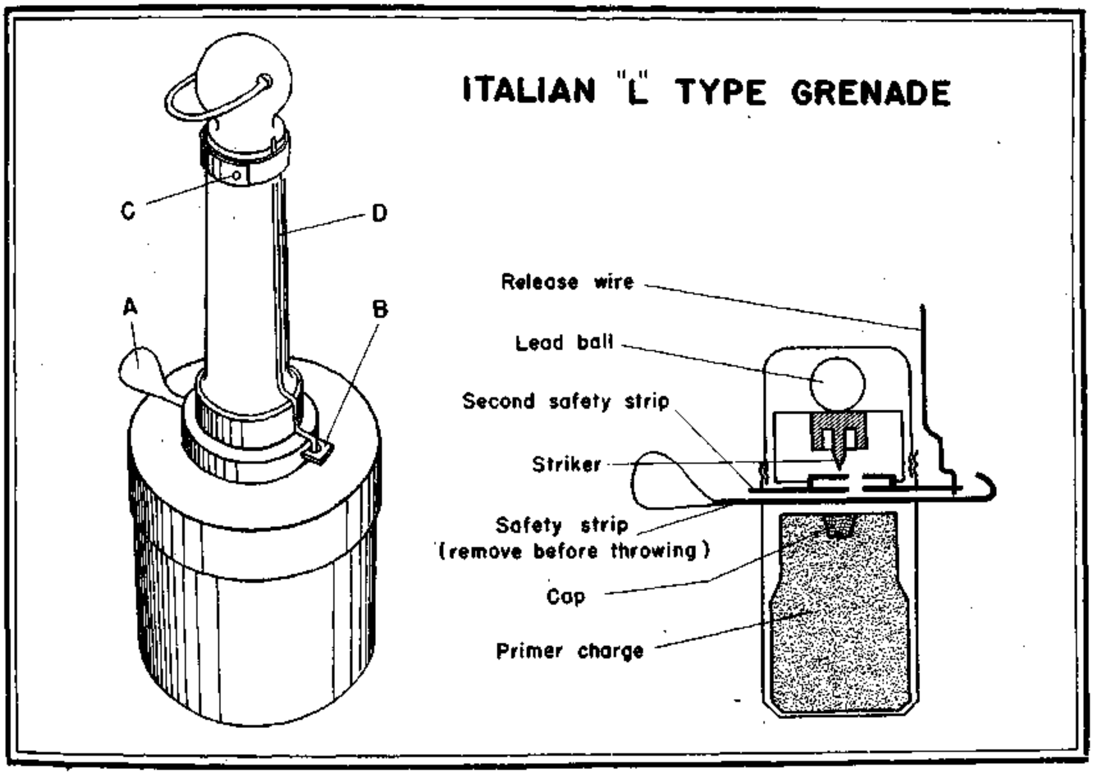
[redacted]

ANTITANK

4. ITALIAN L TYPE GRENADE

The fact that Italy is no longer an active belligerent on the side of the Axis does not eliminate the possibility that much Italian equipment siezed by the Nazis will not be used by the latter against us. Therefore, the desirability of continuing to report information regarding Italian weapons and equipment.

The Italian L type grenade was designed for use against vehicles and tanks. It consists of a metal casing with a wooden throwing handle. On the upper part of the casing there is a tab (a) (see sketch) for removing the safety pin, and a small metal strip (b) protruding from the base of the handle. This strip is a second safety precaution. The metal strip (b) is held in position by the wire (d) on the side of the handle. This wire is held in position by a piece of wired tape secured by a pin (c).



Before throwing the L type grenade remove the safety pin (a), and then, holding the handle firmly, remove the pin (c). Be sure that the wire is held securely. When the grenade is thrown, the wire releases the second safety pin (b).

According to instructions, the grenade should be thrown at a distance of 50 to 80 yards from the target, and if possible, cover should be taken after throwing.

Before using the grenade make sure that:

(1) The safety pin (a) is firmly seated.
(2) The pin (c) is holding the strip of tape securely.
(3) The wire (d) is holding the metal strip (b) in position.

If the safety pin has been removed, the grenade should be handled with care. If the wire (d) has been released the grenade is very dangerous and should not be touched.

Specifications of the grenade are:

Overall length	15 inches
Length of handle	10 3/4 inches
Circumference of grenade	14 1/4 inches
Total weight	4 1/2 pounds

5. GERMAN CONVERSION OF FRENCH 75s INTO ANTITANK GUNS

Conversion by the Germans of French M-1897 75s to make them suitable for use as antitank guns is described in a translation of an article in a recent issue of a Fighting French publication. The writer of the article comments that the captured French artillery, as converted, may serve as hard-hitting, mobile weapons in antiinvasion operations. It is stated that Germany probably has "a good few thousand" of the French 75s which were captured in Poland and France prior to 1941.

Principal features of the conversion of the French 75s are described as follows:

The barrel seems to have undergone only two external modifications:

(1) The addition of a muzzle brake. This brake, which is of the Bofors type, seems to be exceptionally large. If it is compared with a brake of the same type mounted on high-powered Bofors 75, it can be estimated that it absorbs at least 33 1/3 per cent of the recoil.

In all probability the initial velocity is increased. (The regulation initial velocity of the 75, model 97, firing model 10 armor-piercing shell was about 1,800 f/s. Before the war it was possible to obtain an initial velocity of about 2,000 f/s with the model 36 Gabaud shell weighing 13.23 pounds. It can be assumed that the initial velocity of the converted gun will be slightly over 2,000 f/s.

(2) The addition of a light box on the upper part of the barrel a little in front of the supports of the clinometer. Its function is not known but it may be the device for establishing the lead on a moving target.

[redacted]

It does not seem that the position of the trunnions has been changed. The disequilibrium created by the addition of the muzzle brake has been compensated for by the addition of a single equilibrator, low-powered and vertical, acting on the right trunnion of the oscillating cylinder.

The Germans have mounted the gun on a 5-cm Pak 38 carriage known as Pak 97/38 or on a 7.5-cm Pak 40 carriage, when it is known as Pak 97/40.

Although a field piece cannot be judged solely by appearance, the conversion described above seems to be particularly good. The only improvements that have not been effected are the automatic opening of the breech and the firing of the piece by the gunner.

ARTILLERY

6. JAPANESE 70-MM HOWITZER MODEL 92

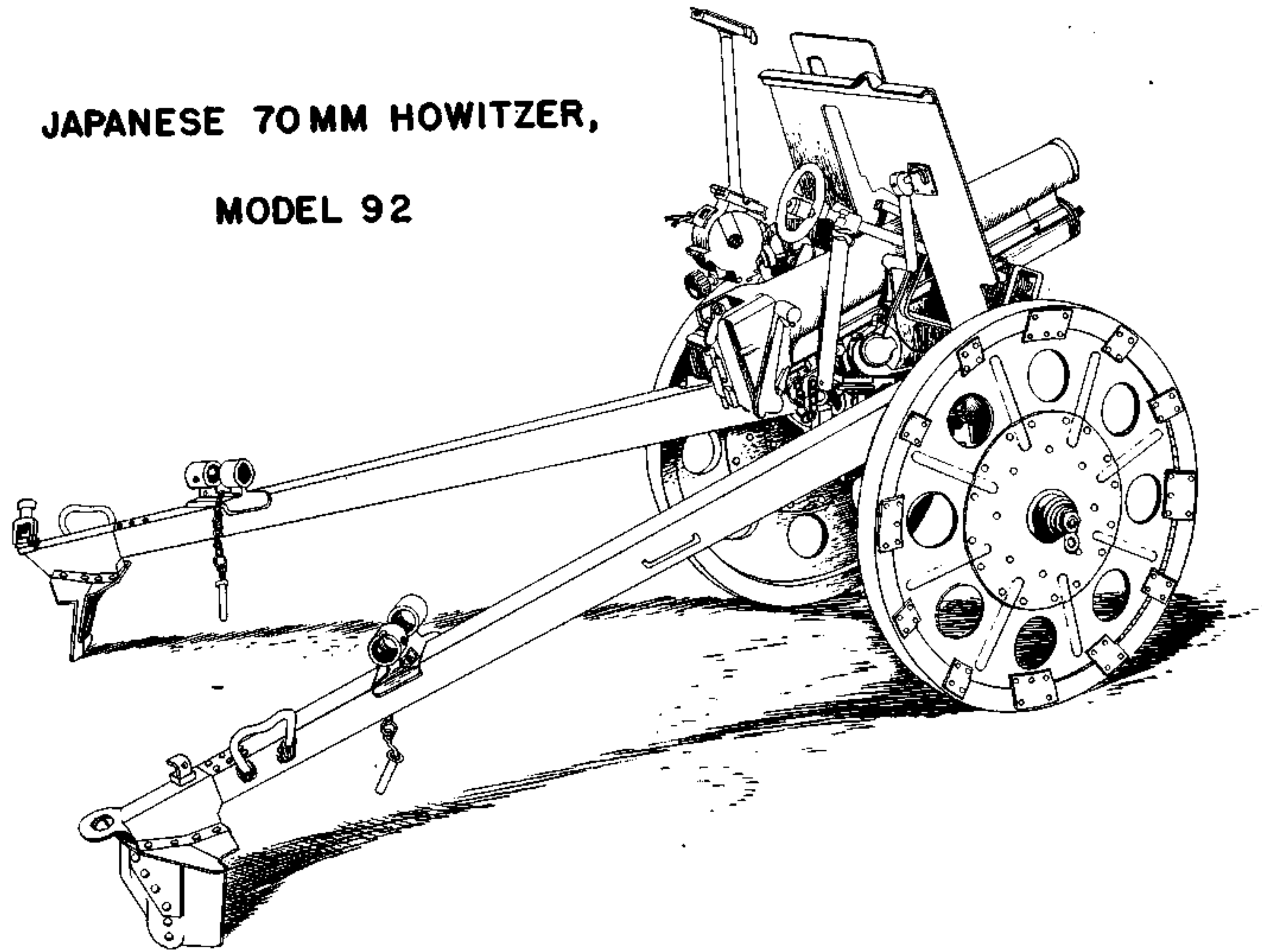
Reports on this weapon indicate that it is generally used as a mortar against personnel.

The howitzer is used with Japanese infantry battalions; ordinarily horse-drawn but it can be manhandled easily by the 10-man section; it can be placed in position by two men; three men can handle it on a good road. The piece is mounted on a cradle which houses the hydro-spring recoil mechanism. It has a steel split-trail carriage mounted on steel disk wheels. The general characteristics follow (see accompanying sketch).

Caliber	70 mm (2.76 in)
Length	
Overall, with tails folded	87 inches
Tube	2 feet, 6 inches
Weight (complete)	468 lbs
Rifling	24 lands and grooves (r/h twist)
Maximum range	3,000 yards
Effective range	1,500 yards
Muzzle velocity	650 f/s
Ammunition	HE, smoke and shrapnel
Weight of shell (HE)	8.36 lbs
Rate of fire	10 rpm
Tube	Monobloc
Breech block	Interrupted thread type
Firing mechanism	Continuous pull
Recoil	Hydro spring
Elevation	50°
Depression	-10°
Traverse	45° each way
Sight	Panoramic
Shield	1/8 in armor

JAPANESE 70 MM HOWITZER,

MODEL 92



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7. NOTES ON GERMAN ARTILLERY TACTICS IN TUNISIA

German artillery, when fighting unseasoned American troops, had a tendency to spread its fire. A reconnaissance officer back from Tunisia relates that he observed a German battery on a height, shift its targets rapidly three times up and down the length of a broad valley, covering each target with short, intense bursts of fire before moving to another. The effect was to slow up movements and compel American units to deploy widely and "keep their heads down." Observation posts were accurately shelled. In such cases, the correct procedure was to take cover, and reoccupy the post as soon as the shelling ended.

8. RUSSIAN ARTILLERY SUPPORT IN TANK ATTACKS

The following article on artillery and tank cooperation in the attack is reproduced from the Soviet newspaper "Red Star."

* * *

When the fringe of the enemy defense has been broken and the leading formations advance to exploit their success, forward artillery observation* is essential. Without this observation, fire from batteries in concealed positions will not be sufficiently effective to give continuous support to the advancing troops. The correct position of the artillery observer has, therefore, for some time, been with the leading elements of the infantry.

The problem, however, is to ensure powerful artillery support to mobile forces effecting a deep penetration. Single guns and gun troops accompanying these forces cannot always succeed in neutralizing enemy strongpoints of resistance. Tanks are either forced to stop or detour, with the result that the tanks are subject to serious threats from their flanks. Artillery time-tables prepared in advance, based only on reconnaissance data, are not sufficiently reliable, in view of the impossibility of discounting all the eventualities in battle.

Practical combat experience has proved that forward artillery observation is possible also in the case of thrusts delivered by tanks. This means that an artillery officer must be with the tanks forming part of the first wave. From this position, he will be able to judge what is holding up the advance; to call for and correct fire, and thus, although expending less ammunition, but achieving greater effect, the problem of providing fire support for advancing tanks is solved. At the same time, the possibility of shelling empty ground or one's own tanks is greatly reduced.

The experience gained by formations recently employed in the offensive on the (Russian) southern front allows for deductions of practical value.

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*See <u>Tactical and Technical Trends</u>, No. 28, p. 8 for a German report on Artillery Forward Observers.

In one case, an artillery regiment was allotted the task of supporting a tank formation which was to effect a deep breakthrough. The commander of the artillery regiment appointed one of his best officers, for liaison duty with the tank formation during the advance. Two days prior to the attack, this Russian officer became friendly with the tank crew allotted to him, learned how to fire the tank gun and machine gun, studied the probable course of the battle, arranged with his regiment the radio code procedure to be adopted for correction and control of fire, and checked the long and short wave lengths. From the beginning of the operation, he assumed command of the tank assigned to him.

As long as the tanks successfully dealt with targets with their own weapons the officer continued in his role of tank commander, and succeeded in destroying an enemy tank gun. Suddenly, however, the tanks came up against heavy opposition The commander of the tank formation gave the order to move to a ravine for cover and allow time for straggling tanks to come up. The moment for fire support to assist the tanks had arrived. The artillery observation officer then transmitted his orders by radio. He directed and corrected the fire, as a result of which a concentration of two batteries succeeded in destroying the enemy points of resistance and permitted the tanks to continue their advance. Supporting fire was not restricted to opposition which was obstructing the advance of the formation to which the officer was assigned, but succeeded in providing assistance to formations advancing on his left flank which permitted the latter to fulfill their task.

A number of valuable lessons can be learned from this experience; first, the fact that forward artillery observation in mobile formations is effective is confirmed. As a result of the radio link the commander of the artillery is at all times aware of the position of the tanks and can provide co-ordinated and directed fire, taking fullest advantage of the range and trajectory.

This link is especially important when, due to weather, or other conditions, aircraft is unable to cooperate with mobile groups. Nevertheless, the organization of this type of forward observation required certain specific preparation. It is essential to assign as observer an experienced officer who is capable of orienting himself in any type of country.

Second, it is necessary to assign two observers to avoid any interruption should the tank of one of the observers be knocked out in action; furthermore, two observers enjoy a better view of the entire field of battle.

The position of the observer in the tank is usually beside that of the tank commander. Through him the observer can decide on various independent tasks, supplement and check the results of his personal observation and can restore communication with his artillery in the event of a break-down of his own radio set. It is emphasized that an observer should not maintain a position too far forward, from where the movement of the main mass of tanks cannot be properly followed. Observation is, furthermore, restricted, owing to the necessity of keeping the tank tightly closed.

The artillery officer is to be warned not to take too active a part as tank commander, and thereby lose sight of his main task. In pursuing individual objectives he may easily reduce his artillery to inactivity and the tanks will fail to receive support when needed. The observer's movements should be based on a careful and skillful maneuver giving him the best possible view of the field of battle, and he must remember that several dozens of guns are more effective than any one tank.

The method for calling for fire and correction is normal; by using a map previously encoded, the observer constantly pinpoints his position. On discovering a definite target he transmits by radio the nearest reference point and the relation of the target to it, at the same time indicating the type of concentration required. In adjusting the fire the observer indicates the correction in meters. The time of opening fire must be so selected as not to interfere with the movement of one's own tanks, unless these are halted in front of the target. The same principle is applied to the observer when putting down a barrage in front of his tanks or in parrying an enemy counterattack.

ARMORED

9. NOTES OF A BRITISH ARMORED FORCE OFFICER ON GERMAN TANK EMPLOYMENT

In Tactical and Technical Trends, No. 28, p. 12, there appeared a translation of a German document issued in the form of a general order by the Panzer Army High Command, listing the 10 rules on the function and employment of tanks. A copy of these rules follows:

1. The tank is a deciding weapon in battle. Therefore, employment should be limited to the "main effort" in suitable terrain.

2. The tank is not an individual fighting weapon. The smallest unit is the tank platoon; for larger missions, the tank company.

3. The tank is not an infantry support weapon. It breaks into and through the enemy line, for the closely following infantry.

4. The tank can take a piece of terrain and clear it, but it cannot hold it. This is an infantry mission, supported by infantry heavy weapons, antitank guns, and artillery.

5. The tank is not to be employed as artillery, which fights the enemy for an extended period from one position. The tank fights while moving with short halts for firing.

6. The mission of the infantry is to pin down enemy defensive weapons, and to follow the tank attack closely in order to exploit completely the force and

morale effect of that attack.

7. The mission of the artillery is to support the tank attack by fire, to destroy enemy artillery, and to follow closely the rapidly advancing tank attack. The main task of the artillery support is continuous flank protection.

8. The mission of the tank destroyers is to follow the tank attack closely and to get into the battle immediately when tank fights tank.

9. The mission of the combat engineers is to clear minefields and to open gaps under tank, infantry, and artillery protection, in order to enable the continuation of the tank attack.

10. The tank is blind and deaf at night. It is then the mission of the infantry to protect the tanks.

* * *

It is interesting to report here the following notes by GHQ, Middle East Forces, based on a report by an experienced armored force officer, which reviews the points presented in the German document.

(1) It is considered that, with the exception of No.'s 2 and 3, the "Ten Commandments" are sound common sense, based on elementary and fundamental principles.

(2) No. 2, however, is interesting, since it reflects the opinions of von Arnim, von Thoma and Stumme (now all prisoners of war) who fought in Russia, where they acquired the habit of using their tanks in "penny packets".

A platoon is 5 tanks, and a company is 17 PzKw 3s, 18 PzKw 4s or 8 PzKw 6s.

Rommel would never have agreed to the company being split, and would normally have preferred to use the battalion, or even the regiment, as the unit of attack, as we would ourselves.

(3) No. 3 is debatable. Against weak antitank defense and no mines, this rule would be true. Medenine* showed that now since we are as well equipped with antitank guns as the Germans, they will have to rewrite this Commandment, and use their tanks in a similar manner to their recent employment by Eighth Army.

(4) It is interesting to note that in No. 8 the main antitank weapon is considered to be the tank-hunting platoon and NOT the tank. This accords with our own views but in the past has not been always understood.

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*In the Mareth Line region

[redacted]

10. DETAILED REPORT ON THE GERMAN "TIGER" PzKw 6

In the early part of 1943 there were repeated reports of a new German heavy tank (Tactical and Technical Trends No. 18, page 6) and as the campaign in North Africa proceeded, more definite information became available (Tactical and Technical Trends No. 20, page 7; No. 24, page 6; No. 30, page 7). The following information is taken from a special report compiled in North Africa after extensive tests on one carefully salvaged PzKw 6 and parts of ten others scattered about the battle area.

* * *

a. Structure and Layout

The dimensions are more or less as previously reported, except for the overall width, which is 11 feet 9 inches and not 12 feet 8 inches as has been stated. The hull is entirely welded. The hull dimensions are:

Width to outside of 28 1/2-inch tracks	11 ft 9 in
Width of hull at top	10 ft 3 1/2 in
Width of hull at nose	6 ft 4 in
Length from nose-plate to silencer	20 ft 7 1/2 in
Length track on ground	12 ft 3 in
Height from ground to hull top	5 ft 8 in
Height from ground to highest point on cupola	9 ft 6 1/2 in
Height from ground to top of wading air intake	15 ft 5 1/2 in
Height from ground to sprocket center	2 ft 3 1/2 in
Belly clearance	1 ft 3 in
Height from floor to turret roof	5 ft 2 in

The turret is made up of a horse-shoe-shaped wall with the circular part at the back. The turret bearing is of the vertical type with the stationary race inside and the moving one outside. It is a ball bearing with 1.6 inch balls and no cage. It contains a variety of sealing arrangements; besides the water seals, there is a felt seal. The traverse ring is in one piece and the clear diameter is 6 feet, 2 inches. The turret seems to come off very easily.

The turret platform is 4 feet 9 inches in diameter, connected to the turret by tubular supports. There are no basket sides. The power traverse hydraulic gear sits in the middle of this. There is a trapdoor at the loader's feet, which with the turret at 12 o'clock, gives access to an ammunition bin underneath. The turret dimensions are:

Height from hull top to turret roof	2 ft 8 1/2 in
Height from hull top to trunnion centers	1 ft 3 1/2 in
Diameter of cupola inside	2 ft 4 in
Diameter of cupola hatch	1 ft 6 in

Diameter of turret ring	6 ft 1 in
Diameter of turret platform	4 ft 9 1/2 in
Number of teeth in ring	204
Width of rack (turret ring)	2 1/2 in

The floor surrounding the turret platform is mostly occupied by ammunition bins and kept fairly free of stowage. A total of 92 rounds of 88-mm ammunition is carried, divided between nose-fuze HE and APCBC-HE*.

The layout of the crew space follows the normal German practice of driver and hull gunner-radio operator in the forward compartment, to the rear and off-side of the transmission respectively, and a three-man turret, thus making a crew of five.

The 88-mm gun is slightly offset to the right side and its recoil guard extends backwards until it nearly reaches the turret ring, thus dividing the fighting space into two unequal parts. The gunner's seat is well forward and low down on the left side and the commander's seat immediately behind it and higher up; they occupy the larger of the two portions of the chamber, but both are rather cramped.

The loader, having the smaller right side to himself, has more room; the rounds of ammunition are 36 1/2 inches long and nearly 4 1/2 inches in diameter at the rim, so he needs every bit of space. The co-axial machine gun is readily accessible.

b. Armor and Vulnerability

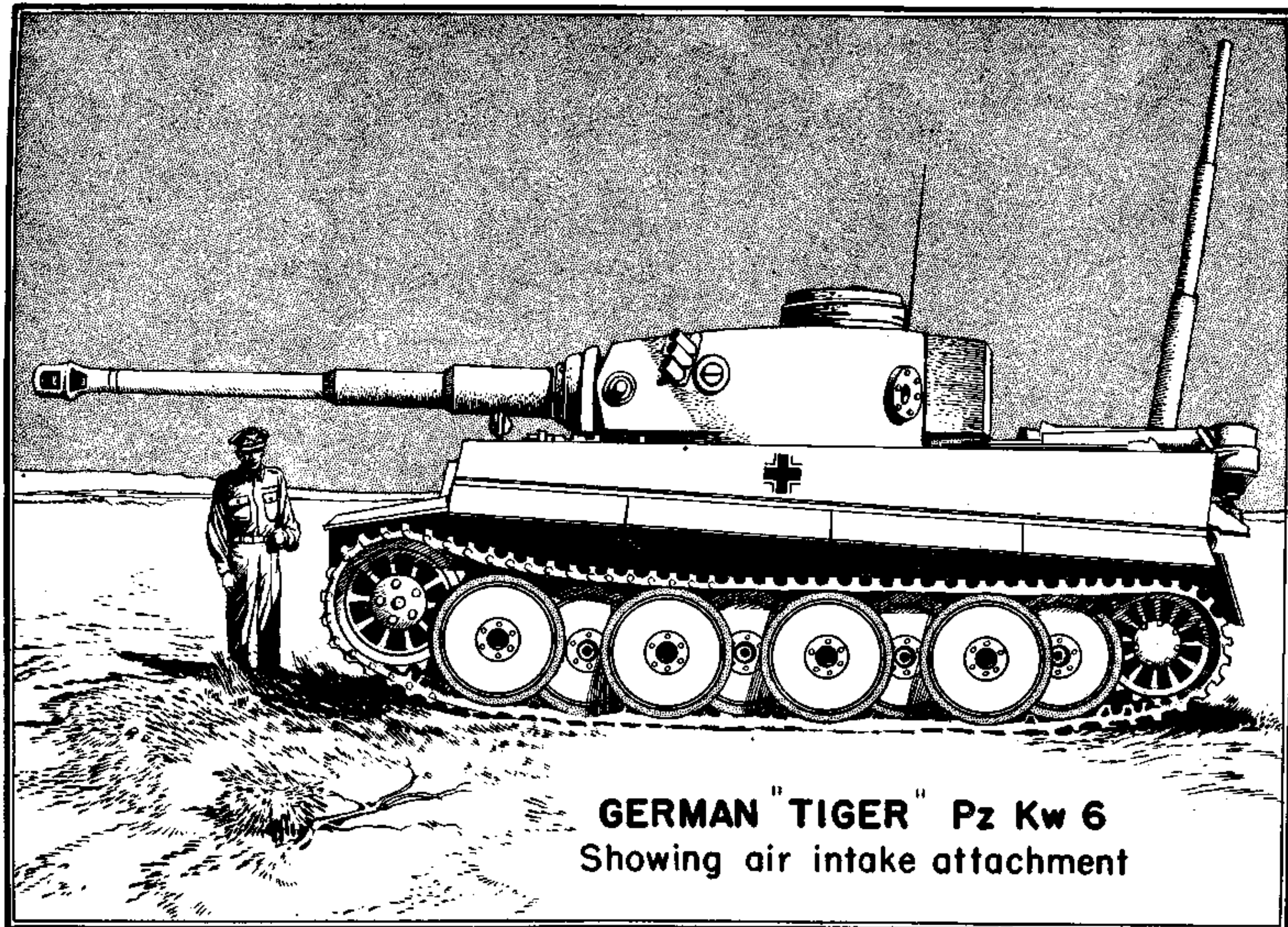
The figures already given for armor thickness are confirmed, but there are still doubts as to the quality. Armor thicknesses are as follows:

Lower nose at 20°	4.02 in	Driver's visor at 10°	4.02 in
Rear plate at 20°	3.23 in	Upper side	2.44 in
Lower side	2.44 in	Glacis	2.44 in
Hull roof	1.02 in	Flooring	1.02 in
Belly	1.02 in	Turret front	3.93 in
Turret wall	3.23 in	Turret roof	1.02 in
	Mantlet casting	3.93 in (approx)	

The side plating shows surface hardness and brittleness, with a strong tendency to crack and flake. The side plate of the turret also flakes badly on the inside..

The limiting angle for penetration of the 75-mm gun against the 3.23 inch plate is 17°, but it will penetrate the lower 2.44 inch plate at 30°.

*Armor-piercing (projectile) capped with ballistic cap high explosive.



GERMAN "TIGER" Pz Kw 6
Showing air intake attachment

[redacted]

The guns used were the 75-mm (M.3) gun in a Sherman tank and a worn 6-pounder (Mk.III-57 mm) in a Churchill tank. It is not possible to give even an estimate of the equivalent full charge. The range for the test was restricted to 100 yards. The cast armor of the mantlet seems to be of good quality, and does not break up or crack under heavy attack. None of those examined had been penetrated. The mantlet covers the entire front of the turret and there is no doubt that it gives far better protection than an internal one.

There is no protection for the turret ring other than that provided by raising the driver's visor plate 2 inches above the hull roof. This is not very effective and an additional weakness is indicated by the penetration of two 75-mm projectiles which were deflected downwards on to the hull roof from the lower edge of the mantlet and turret front.

A trial attempt was made against the front of one of these tanks with PIAT* projectiles but they failed to penetrate either the mantlet or the front 4.02 inch plate. A German "beehive" magnetic hollow charge was tried out on the 3.23 inch side plate and successfully penetrated it.

In general, it seems that the protection afforded by this tank is very good and that for effective AP attack, a gun of the 17-pounder (3-in) class is needed. We have reason to believe, however, that the tracks and bogies, which present a large target area, are liable to damage by HE from field and medium artillery.

c. Armament

The 88-mm (3.46 in) is of the normal type with semi-automatic breech mechanism; it can use antiaircraft ammunition which has been provided with electric primers. The gun has the usual electric safety devices which prevent it from being fired if the breech is not fully closed, or the gun is not entirely back in battery position.

There is also the push button switch for the loader to press when he is ready for the gun to be fired, which completes the firing circuit and lights up a signal light in front of the gunner. The tests disclosed the following pertinent data as to the 88-mm gun:

Length from muzzle to trunnion centers	13 ft 6 1/4 in
Length from trunnion centers to rear of breech	4 ft
Elevation	15°
Depression	-8°
Length of HE round	3 ft 1/2 in
Diameter of cartridge rim	4 7/16 in
The gun has semi-automatic gear and recoil guard with deflector bag	

*Projector, infantry antitank

[redacted]

The co-axial gun is fired mechanically by means of a pedal near the gunner's right foot. The two machine guns are of the normal type, the hull gun being ball-mounted in the usual fashion. There are three smoke dischargers on each side of the turret. They are fired electrically by three push buttons on each side of the commander's seat.

The smoke generator is lettered No. K.39. It is 3.8 inches in diameter. It is propelled by a charge of powder in a transparent plastic capsule which has a small diameter, threaded extension for screwing into the base of the generator. The charge is fired by a brass electric primer, which is screwed into the base of the discharger from the back.

Up the center of the generator, and held in place by the propellant capsule, is a tube containing some kind of igniter. The loading of these devices cannot easily be done in the heat of battle.

d. Laying and Sighting

The turret is provided with a hydraulic traverse, power driven through a vertical shaft in the center of the base junction. The gunner controls this with a rocking foot plate which gives variable speed in either direction. Maximum rate of traverse appears to be rather slow. The gunner is provided with a hand traverse which can be assisted by a second handwheel operated by the commander.

The degree of traverse of the turret is recorded on a dial in front of the gunner, and there is also the usual traverse ring in the commander's cupola. Both devices are driven off the turret-ring rack through jointed shafts.

Elevation is by handwheel geared with considerable reduction into a toothed sector. The muzzle-heaviness of the gun with its external mantlet is considerable, and a compensating spring, similar to that of PzKw 4 Special is provided.

Maximum elevation if 15° and depression-8°. The gun appears stiff to elevate but depresses quite easily. An elevation lock is provided for travelling, by which the breech aan be clamped to the turret roof.

Binocular sighting is provided. This consists of two of the normal jointed telescopes mounted side by side in a frame. The eye pieces are offset from the telescope center lines by the insertion of episcopic prism assemblies, (reflecting lenses) and inter-ocular distance can be adjusted by rotating them in opposite directions. They are geared together, so as to ensure that the motion is shared equally.

e. Lookouts and Hatches

The commander has a raised cupola of the normal type with five slits backed by the usual size triplex blocks. The field of view is good. The front block has sight bars on it for lining up the turret.

There are two lookouts of the same type in the forward parts of the turret, at 10 and 2 o'clock. There are also machine-gun ports at 4 and 8 o'clock, covered by an internal rotary shield.

The driver has the usual long triplex visor-block protected by an adjustable slit. He also has the regulation type episcopic binocular. For vision to his own, the left side, he has a prism episcopic set to look about 30° forward to the side.

The hull gunner has the usual episcopic sighting telescope fitted to the ball mounting of his machine gun. He also has a prism episcope, similar to that of the driver, for looking out to the right. Both these episcopes are fitted in the hatch doors.

The hatch in the cupola and those above the driver and forward gunner are circular, about 18 inches in diameter and spring supported; they can be closed down against a rubber ring so as to be completely water tight.

There is a rectangular hatch above the loader which is also provided with a rubber sealing ring. The size of this opening is about 20 x 14 inches. In one tank there was a large diameter escape hatch at 4 o'clock in the turret wall, in place of one of the pistol ports.

f. Amphibious Characteristics

The tank has been initially designed for total immersion in water. All the crew's hatches are provided with rubber seals and multiple bolts. The engine compartment can also be sealed off; its cover is normally screwed down on to sealing strips and it can be isolated from the radiator and fan compartments on either side of it, drawing air from a special intake pipe over the engine hatch, the top of which is 3 3/4 inches internal diameter and 15 1/2 feet from the ground. (see sketch)

No attempt is made to plug the cooling air inlets and outlets, so that the radiators run totally submerged, the fans being disconnected by special clutches. The only other aperture required is for the exhaust and this is dealt with by a simple flap-valve on top of the silencer, which is normally held open.

A free translation of an instruction plate inside one of the turrets is as follows:

(1) Lock turret and gun.
(2) Free mantlet sealing frame, push forward and secure by means of locking nuts.
(3) Remove MG and fit in sealing rod.
(4) Draw back telescopes, turn sealing stopper upwards and clamp slide with locking nut.
(5) Plug gun cradle by turning handwheel above the gun.
(6) Pump the sealing hose in the turret race up to 2.5 atmospheres.
(7) Open water-drain tube.

[redacted]

(8) Tighten the nuts on the vision slit frames.
(9) Open the machine-gun ports and fit sealing stoppers.
(10) Fit water-tight muzzle cap.
(11) Fit sealing cap on the ventilating fan exit in the turret roof.
(12) Close hatches.
(13) Tighten levers in commander's cupola.
(14) In the event of the sealing hose not being tight and letting water through the drain tube, close drain tube and tighten inner sealing ring in the turret.
(15) To lay and fire after emerging, sealings 1 to 6 and 14, at least, must be opened up.

The result of this is to make it possible to immerse the tank completely, drawing air through the long intake pipe. Allowing for a certain amount of free-board and the possibility of having to climb a steeply sloping beach, operation in 14 feet of water should be practicable.

The intake pipe is in three sections, which normally rest inside one another in the hull, but can be fitted together and erected very quickly. There seems no reason why an extra length should not be added if additional depth is required.

Air enters and discharges vertically through a horizontal grating on each side of the radiator block which is isolated from the engine compartment. Inflammable liquids such as from SIP* grenades, drawn swiftly through the radiator block, are not likely to do it much injury.

g. Ventilation

The engine breathes from its own compartment and therefore keeps the air circulating through it. There are, in addition, two passages passing through the sidewall on each side into the space between the fans and the radiator block. When engaged in amphibious operations, these passages are closed by butterfly valves actuated by the same lever that disconnects the fan clutches.

It is thought, that when the tank is closed down for amphibious operations, air is drawn down the long tube into the engine room and part of it is diverted through the engine room bulkhead ventilator by the suction of the fan and so ventilates the crew's accommodation before passing to the engine. The only air exit found seems to be through the engine exhaust, and if the engine stops, all ventilation must cease.

For normal evacuation of gun fumes etc., two electric fans are provided, one in the turret roof behind the loader, and one on the center line of the hull roof between the driver and forward gunner. These have ordinary mushroom type outlets, to which waterproof covers can be secured when necessary.

*Self-igniting phosporus.

[redacted]

Radiators		Fans	
Number per tank	2	Number per tank	4
Matrix width	35 in	Number of blades	8
Matrix depth	20 in	Overall diameter	17 1/2 in
Matrix thickness	7 in	Disk diameter	9 1/2 in
Grill spacing	7 per in		
Rows of tubes	6		

h. Engine

The engine is a V-12, 60°, Maybach gasoline engine developing 650 bhp* There are four down-draught non-spillable carburetors, each with twin throttle tubes and quadruple floats. Ignition is by two Bosch magnetos of the rotating magnet type, driven off the live end from positions above the rocker gear.

i. Steering and Final Drive

The principal method of steering is by hand wheel, and this operates a fully regenerative system giving geared turns of varying radius with the same sort of "neutral swing" as the Merritt Brown transmission.** In addition to this there are two skid brake levers.

j. Suspension and Tracks

The interleaved bogies and independent torsion-bar suspensions are substantially as previously reported.

Hydraulic piston-type shock absorbers are provided for the front and rear suspension only. They are mounted inside the hull, the front ones being in the forward compartment. These tanks seem to have a certain amount of trouble with their tracks; the rings securing the track pins seem to be too weak for their job. There are eight torsion bars per side, three bogie wheels are mounted on each bar. This arrangement is for the 28 1/2-inch track. The eight outside wheels are removed when the narrow 21-inch track is used.

k. Performance

It is difficult to assess the performance of this tank. The weight appears to lie between 50 and 60 tons. The maximum speed is estimated at 15 to 18 mph. The cross-country ability is also a matter for conjecture.

l. Conclusions

There is no doubt that the Germans have produced a very formidable tank, and that it must have been conceived with the idea of making beach landings on the shores of Britain. The waterproofing facilities are certainly superior in design and execution to anything that we have hitherto imagined.

*Brake horsepower.

**One of two types of British transmission.

[redacted]

CHEMICAL WARFARE

11. ITALIAN PORTABLE FLAME THROWER, MODEL 41

The flame thrower has been used with deadly effect in this war. In an attack against a modern fort built of steel and concrete, it could well be the most important instrument of the attack.

According to British sources the two previously used Italian flame throwers, the 35 and 40, have become obsolescent due to their excessive weight. These models have been superseded by model 41.

The weight of the new model is 40 pounds, and it has a range of from 17 to 22 yards, and a fuel capacity of 1.75 gallons. The fuel used is a mixture of 9 volumes of heavy oil and 1 volume of gasoline. The duration of a continuous jet is five to six seconds.

The range and efficiency of the model 40 is reported to have suffered seriously because of the use of the impeller in the oil stream. It also presented a very heavy load to the operator. In the model 41, the impeller driven magneto is operated by the compressed air passing to the fuel cylinders. In this way the flow of fuel is not affected. The quantity of fuel carried in the model 41 is much less than in the previous models. The capacity of the 35 was 2.6 gallons.

There are three containers, two for fuel oil and the third for compressed air which is used as a propellant. The fuel cylinders are on the outside with the compressed air cylinder between, and slightly to the rear of them.

Each fuel cylinder is about 1 1/2 to 2 feet high, 5 to 6 inches in diameter and is charged with 0.9 gallons of fuel oil.

The left cylinder carries on its top a luminous dial pressure gauge while the right cylinder is fitted with a refueling neck and an outlet tube in the same positions as in model 40 (for a description with sketches of both models 35 and 40 reference may be had to Special Series, No. 16, Enemy Capabilities for Chemical Warfare, prepared by the Military Intelligence Service, War Department).

The compressed air container is charged through a valve in the top from high pressure cylinders. Attached to the sides, near the bottom, is an impeller-driven magneto, which functions by the compressed air passing to the fuel cylinders. This magneto supplies the current for the spark ignition system.

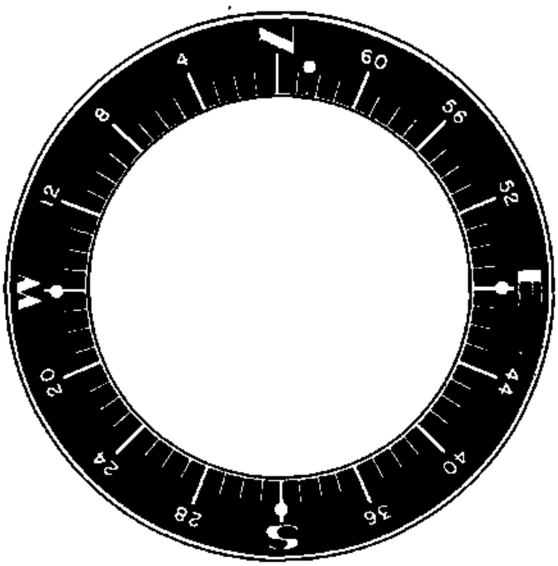
<u>Comment:</u> This equipment embodies the most obvious and most important improvements in the model 40. The range and efficiency of the earlier model suffered seriously because of the use of the impeller in the oil stream, and also presented a very heavy load to the operator, who was required to carry it when approaching, usually under difficult conditions of terrain, to within a very short distance of his target. The change-over of the drive from the impeller to the compressed air stream, where it cannot affect the flow of fuel is the obvious correction of the former trouble, while the latter drawback has been overcome only by considerable reduction in the quantity of fuel carried.

[redacted]

ENGINEERS

12. GERMAN COMPASS CARD

The accompanying sketch shows a drawing of a German compass card. This compass card is often used in recording minefields and reference is frequently made to the compass card in enemy minefield charts. Such references will be identified in the "bearing in degrees" column on the minefield charts by the letters MKZ (Marschkompass). The circle is divided into 64 divisions in a counter-clockwise direction, probably corresponding to 6,400 mils.



13. GERMAN BUTTERFLY BOMB

Recently received information permits supplementation of the brief description in Tactical and Technical Trends, No. 29, p. 2 of the German SD* 2-kilogram "butterfly" bombs.

Three types of fuzes are found in these bombs:

(1) 41 Fuze

Selector screw can be set for bomb to explode in the air Zeit (time) 3 seconds delay after being armed, or on AZ (impact). The bomb is not armed unless 4 threads of the arming spindle are visible. The fuze is screwed into place. The bomb is very sensitive if selector switch is set at Zeit.

*SD designates a bomb which has a thick casing and achieves its effect chiefly by fragmentation.

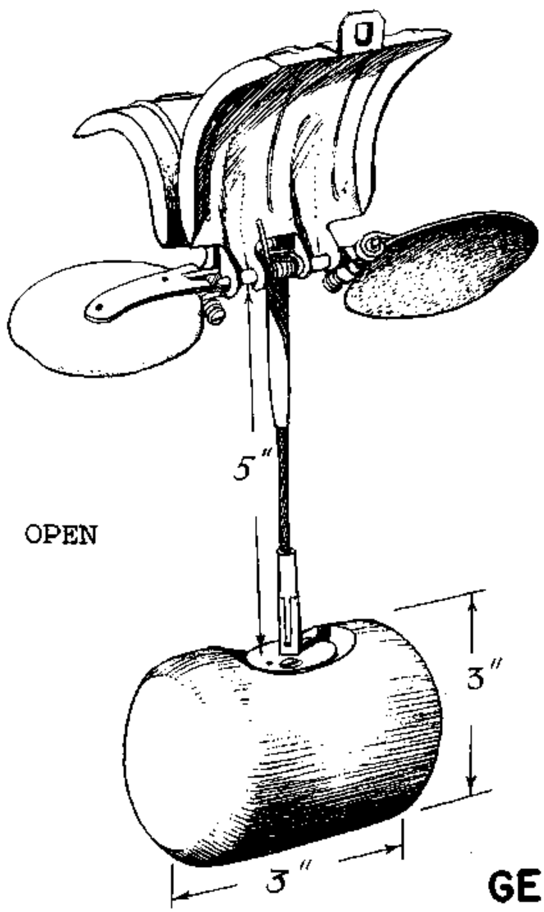
[redacted]

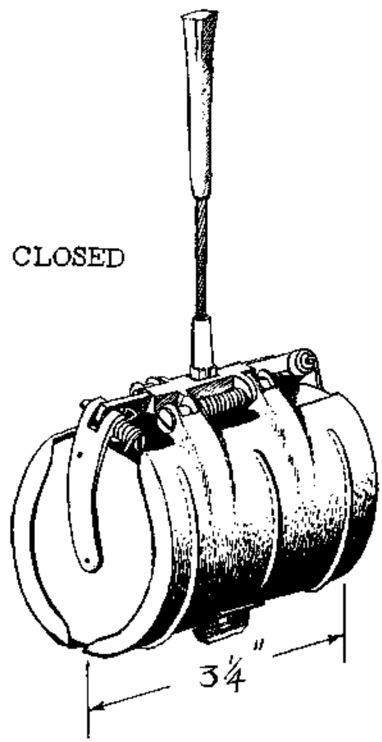
(2) 67 Fuze

Clockwork device which can be set for time delay up to 30 minutes. This fuze can be set for impact ignition also.

(3) 70 (A) and 70 (B) Fuzes

These are designed to function if the bomb is disturbed or vibrated after falling, hence they are essentially antihandling fuzes. If these fuzes are armed, 3 threads of the arming spindle must be visible.





GERMAN BUTTERFLY BOMB

Fuzes 67 and 70 are pushed into the bomb and secured in position by two projections which fit into slots in the casing.

All these fuzes should be treated cautiously. If there is uncertainty regarding the type of fuze, do not approach for 30 minutes. To dispose of an unexploded bomb, build a small sandbag wall around it and destroy in place. The

bomb may be detonated by placing a small charge beside it, or a rope may be used. If the latter method is adopted, pull the rope from behind cover.

"Butterfly" bombs are dropped from a container holding 23 bombs. If the container falls to the ground unopened or partly opened, with bombs still intact, the container and contents should be detonated in place. If this is not feasible the container should be carried to a trench or other convenient place and detonated therein. Lay the charge on top of the container and tamp with earth. If the charge has not been well laid some bombs may be blown clear. As a precaution, 30 minutes after detonating the container, search the area for bombs and if any are found, detonate in place.

INFANTRY

14. NOTES ON THE GERMAN INFANTRY DIVISION

a. General

The organization of the German infantry division has remained fairly constant since the conclusion of the Polish campaign. While individual infantry divisions may differ from what is generally considered as standard organization, this difference may be attributed to improvisations due to losses, tactical considerations in specific theaters as dictated by terrain, the availability of material, opposition, or simply experimental shifts in organization.

The strength of the normal infantry division, counting the divisional supply troops, is approximately 17,000 officers and men. This figure can be considered as being maximum for the organic component parts of the division. When in combat, a division up to full strength, with added GHQ troops, will exceed this figure.

The infantry division relies mainly on animal transport for moving supplies and equipment within the combat units. Units requiring mobility for tactical reasons, such as the antitank battalion and infantry antitank companies, are motorized. The supply troops are equipped with motor transport since the hauling of supplies covers great distances when an attack moves forward. Often the supply vehicles of the division are pressed into service as motor transport for the main combat elements of the division if this does not interfere with the primary duties of the vehicles.

b. Infantry Regiment

Three infantry regiments compose the infantry element of the division. Each infantry regiment is composed of a headquarters, headquarters company, three infantry battalions, an infantry howitzer company, an antitank company, and a light infantry column. There are four companies in each battalion and they are consecutively numbered. Companies 1, 2, 3, 4, form the first battalion; 5, 6, 7, 8 form the second battalion; 9, 10, 11, 12 form the third battalion. The infantry

[redacted]

howitzer company is the 13th company while the antitank company is the 14th company.

(1) Headquarters Company

This consists of a headquarters, a communications platoon, a mounted platoon and an engineer platoon. The usual trains (combat-ration-baggage) are included. The communications platoon has a telephone and a radio section; the mounted platoon consists of three squads of horse-mounted infantrymen for reconnaissance purposes; the engineer platoon consists of three identical sections of two squads each, and has three light machine guns for armament.

(2) Infantry Battalion

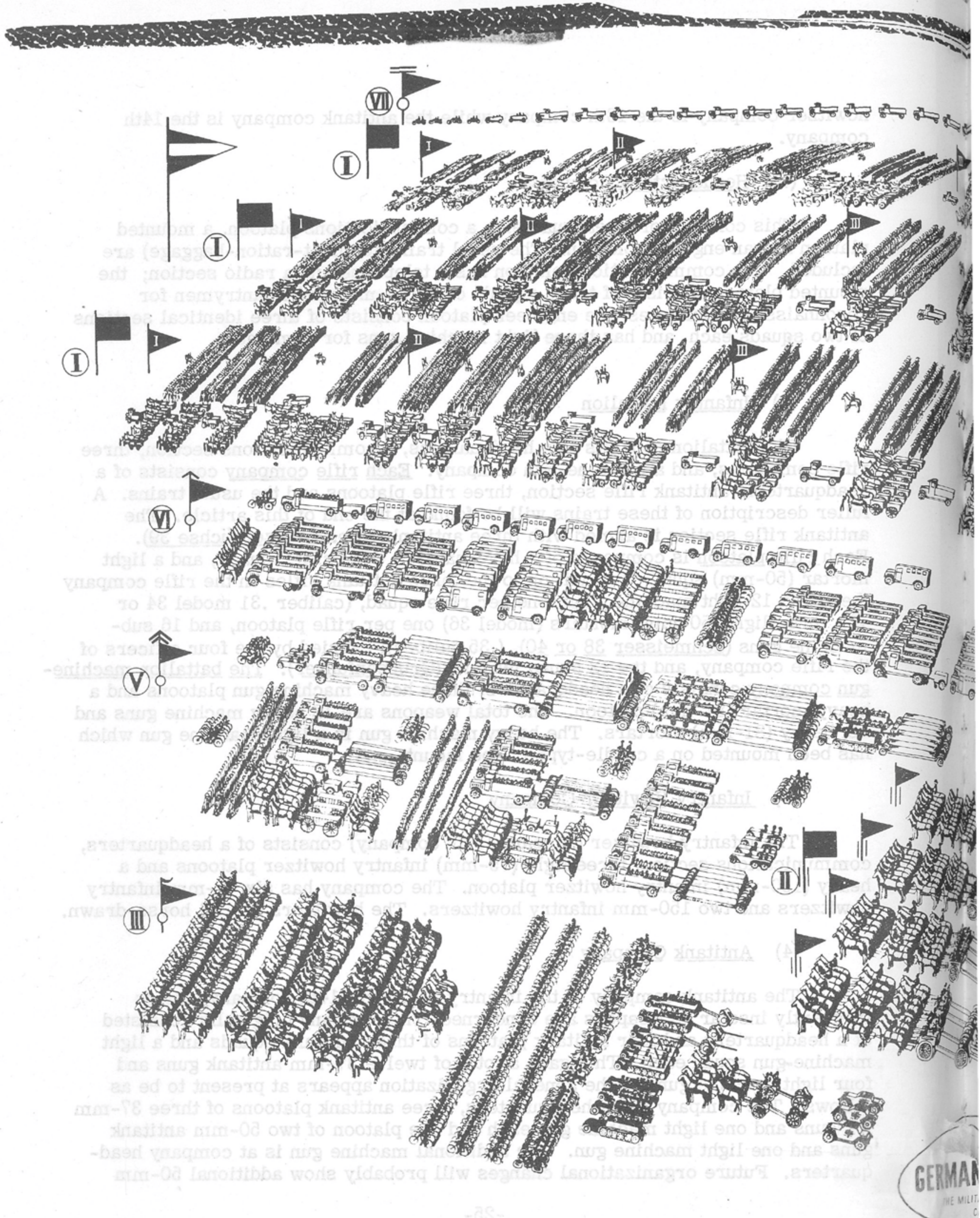
The battalion consists of a headquarters, a communications section, three rifle companies, and a machine-gun company. Each rifle company consists of a headquarters, antitank rifle section, three rifle platoons and the usual trains. A fuller description of these trains will be found at the end of this article. The antitank rifle section is armed with three antitank rifles (Panzerbüchse 39). Each rifle platoon is composed of a headquarters, four rifle squads, and a light mortar (50-mm) squad. In addition to the three antitank rifles in the rifle company there are 12 light machine guns, one per rifle squad, (caliber .31 model 34 or 42), three light (50-mm) mortars (model 36) one per rifle platoon, and 16 sub-machine guns (Schmeisser 38 or 40), (.35 caliber), carried by the four officers of the rifle company, and the 12 squad leaders (Gruppenfuhrer). The battalion machine-gun company consists of a headquarters, three heavy machine-gun platoons and a heavy mortar (81-mm) platoon. The total weapons are 12 heavy machine guns and six heavy (81-mm) mortars. The heavy machine gun is a light machine gun which has been mounted on a cradle-type tripod mount.

(3) Infantry Howitzer Company

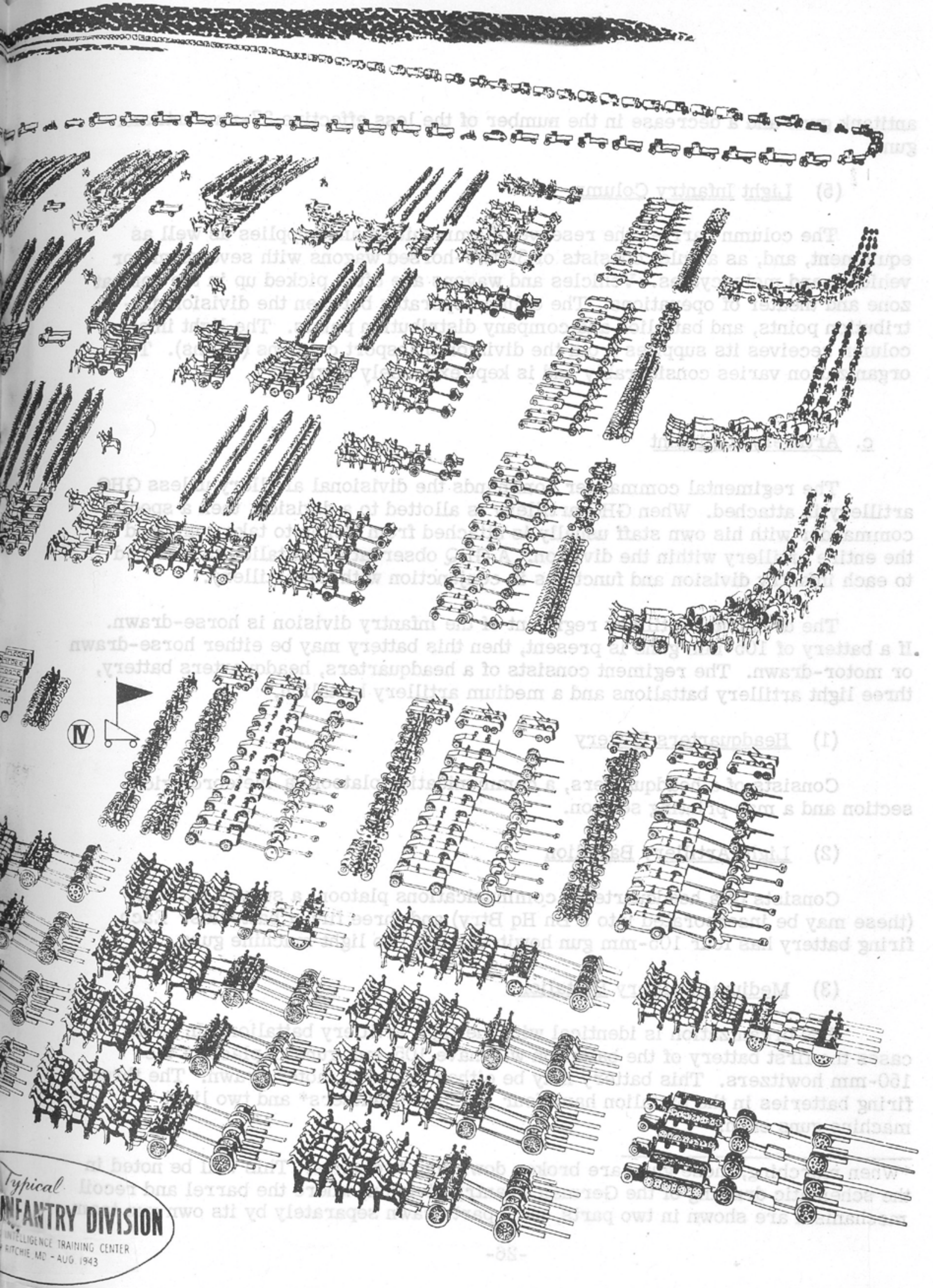
The infantry howitzer company (13th company) consists of a headquarters, communications section, three light (75-mm) infantry howitzer platoons and a heavy (150-mm) infantry howitzer platoon. The company has six 75-mm infantry howitzers and two 150-mm infantry howitzers. The howitzers are all horse-drawn.

(4) Antitank Company

The antitank company of the infantry regiment (14th company) varies frequently insofar as weapons are concerned. The company originally consisted of a headquarters and four antitank platoons of three antitank squads and a light machine-gun squad each. This gave a total of twelve 37-mm antitank guns and four light machine guns. The general organization appears at present to be as follows: The company has a headquarters, three antitank platoons of three 37-mm AT guns and one light machine gun each and one platoon of two 50-mm antitank guns and one light machine gun. One additional machine gun is at company headquarters. Future organizational changes will probably show additional 50-mm



I INFANTERIE REGIMENT INFANTRY REGIMENT 99 OFF - 3059 EM		I J. R. I R X 3	I J. R. I R 297 OFF - 9177 EM	II ARTILLERIE REGIMENT ARTILLERY REGIMENT OFF & EM - 2100		III AUFKLÄRUN... RECONNA... OFF...
LMG	115		345	105 mm GUN HOWITZER	36	LMG
HMG	36		108	150 mm GUN HOWITZER	8	HMG
L MORT	27		81	105 mm GUNS	4	L MORTARS
H MORT	18		54	LMG	24	H MORTARS
AT RIFLE, .31	27		81			AT GUNS 37mm
AT GUN 37mm	12		36			INFANTRY HOWITZ...
L INF HOW 75mm	6		18			ARMORED CARS, ...
H INF HOW 150mm	2		6			



…S ABTEILUNG …CE BATTALION – 575	IV PANZERJÄGER ABTEILUNG ANTI-TANK BATTALION OFF & EM — 599		V PIONIER BATAILLON ENGINEER BATTALION 26 OFF — 851 EM		VI NACHRICHTEN ABTEILUNG SIGNAL BATTALION 15 OFF — 459 EM	VII DIV. NACHSCHUB SUPPLY COLUMN OFF & EM — 2200	
24	LMG	18	LMG	27	TELEPHONE CO	H-DR VEHICLES	30*
8	AT GUNS, 37mm	12	AT MINES	1500	RADIO CO MTZ	HORSES	218*
3	AT GUNS, 50 mm	18	2 COS, PARTLY MTZ		L SIGNAL COLUMN	MTCL	98*
3			1 CO MTZ			TRUCKS & CARS	325*
3			1 BRIDGING COLUMN				
2						*APPROXIMATELY	
3							

[redacted]

antitank guns and a decrease in the number of the less effective 37-mm antitank guns.

(5) Light Infantry Column

The column carries the reserve of ammunition and supplies as well as equipment, and, as a rule, consists of 39 two-horsed wagons with several motor vehicles and motorcycles. Vehicles and wagons are often picked up in the combat zone and theater of operations. The column operates between the division distribution points, and battalion and company distribution points. The light infantry column receives its supplies from the division transport columns (trains). The organization varies considerably and is kept extremely flexible.

c. Artillery Regiment

The regimental commander commands the divisional artillery unless GHQ artillery is attached. When GHQ artillery is allotted to a division, then a special commander with his own staff usually is attached from Corps to take command of the entire artillery within the division. A GHQ observation battalion is attached to each infantry division and functions in conjunction with the artillery.

The divisional artillery regiment of the infantry division is horse-drawn. If a battery of 105-mm guns is present, then this battery may be either horse-drawn or motor-drawn. The regiment consists of a headquarters, headquarters battery, three light artillery battalions and a medium artillery battalion.

(1) Headquarters Battery

Consists of a headquarters, a communication platoon, a meteorological section and a map printing section.

(2) Light Artillery Battalion

Consists of a headquarters, communications platoon, a survey section (these may be incorporated into a Bn Hq Btry) and three firing batteries. Each firing battery has four 105-mm gun howitzers and two light machine guns.

(3) Medium Artillery Battalion

The organization is identical with the light artillery battalion. In some cases the first battery of the battalion will have 105-mm guns in place of the 150-mm howitzers. This battery may be either horse or motor drawn. The three firing batteries in the battalion have four 150-mm howitzers* and two light machine guns each.

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*When marching, these guns are broken down into two parts. This will be noted in the schematic drawing of the German infantry division, where the barrel and recoil mechanism are shown in two parts, each part drawn separately by its own gun team.

[redacted]

(4) Motorized Ammunition Columns

For hauling artillery ammunition these columns are attached from the division transport columns as soon as combat becomes imminent.

d. Reconnaissance Battalion

The reconnaissance battalion of the infantry division consists of a headquarters, a communications platoon, a horse troop, a bicycle troop and a heavy weapons company.

(1) Horse Troop

The horse troop consists of a headquarters, three platoons of three squads each and a heavy machine-gun section. Weapons are nine light machine guns and two heavy machine guns.

(2) Bicycle Troop

The bicycle troop is organized along the same lines as the horse troop. Weapons are nine light machine guns, three light mortars and two heavy machine guns. The troop contains a proportion of motorcycles.

(3) Heavy Weapons Company

The heavy weapons company consists of a headquarters, an antitank platoon of three 37-mm (or 50-mm) antitank guns and one light machine gun, an engineer platoon with three light machine guns, a heavy machine-gun platoon with four heavy machine guns, an infantry howitzer platoon with two 75-mm infantry howitzers and an armored car platoon with three light (Horch type)* armored cars. A section of heavy mortars may be added (three 81-mm mortars).

The original reconnaissance battalions of the peace-time standing army were organized from existing corps cavalry regiments upon mobilization.

In some cases the horse troop has been replaced by a bicycle troop.

e. Antitank Battalion

The antitank battalions have undergone frequent changes insofar as weapons are concerned. The battalion consists of a headquarters, a communications platoon and three antitank companies. Originally each antitank company had twelve 37-mm antitank guns and four light machine guns. Subsequently, the organization of the companies was changed to eight 37-mm antitank guns, three 50-mm antitank guns and six light machine guns. The next reorganization saw

*The standard German light armored car Sd.Kfz 222, three ton, 4-wheel drive and mounting one 20-mm, and one 7.92 MG coaxially.

six 50-mm antitank guns, four 37-mm antitank guns and six light machine guns in each company. This seems to be the most widely used organization at present. There are many battalions that have variations in each company with at least one company equipped with nine 50-mm antitank guns, six light machine guns and no 37-mm antitank guns. The trend is shifting towards the company with nine 50-mm AT guns. The development of a stick-bomb which can be fired from a 37-mm AT gun and is effective against heavier tanks has kept the 37-mm from becoming totally obsolete.

A newer and heavier antitank gun is in existence, namely, the 75-mm (Pak 40) antitank gun. This weapon has been used frequently but no table of allowances is known regarding this weapon. A complete company of this type of antitank gun consists of seven to nine guns; if motor-drawn, nine guns, if self propelled, seven. It is believed that these weapons will be issued to armored divisions first and as more become available they will appear in infantry divisions.

f. Engineer Battalion

The engineer battalion consists of a headquarters, a communications section, two partially motorized companies, a heavy motorized company, a bridge column, and a light engineer column. The bridge column is not always found organically but may be assigned from the Army GHQ engineer pool.

(1) Partially Motorized Company

The partially motorized companies are organized into a headquarters, three platoons of three squads each and their trains. Nine light machine guns are found in each partially motorized company, as well as three AT rifles and 13 sub-machine guns.

(2) Heavy Motorized Company

The heavy motorized company is organized the same way as the partially motorized company but is fully motorized, and contains an organic motor-maintenance section. The armament is the same as that of the partially motorized company

(3) Bridge Column

The bridge column carries the necessary bridging equipment. This includes the pontons, decking, motorboats, etc.

The battalion has approximately 72 pneumatic boats, 16 pontons, 2 motorboats, etc. A platoon of assault boats may be added. The bridge column as previously noted may be withdrawn to GHQ if the division is engaged in terrain where its special equipment would not be necessary.

g. Signal Battalion

The signal battalion consists of a headquarters, a telephone company and a

[redacted]

radio company. The battalion has the duty of laying a communications network to the headquarters of the various regiments and battalions within the division and also with the division on the right flank. The battalion has 4 light machine guns.

h. Division Supply Troops

The division supply troops consist of the administrative troops, division supply columns (trains), medical battalion, veterinary company, military police and the postal service (field post office).

(1) Administrative Troops

These consist of a bakery company and a slaughter platoon plus the administrative personnel to handle all administrative matters pertaining to supply. The motor transport of this unit is used to haul rations to distribution points.

(2) Division Supply Columns (Trains)

The trains consist of 8 motor transport columns each with a capacity of 30 tons. In addition there is a motor repair shop and workshop which does the necessary repair work on wagons, vehicles and arms. A supply company, and a light and a heavy fuel and oil column are also included. The supply company furnishes the personnel necessary for loading and reloading of supplies.

(3) Medical Battalion

This consists of a horse-drawn and a motorized medical company, a field hospital and two ambulance platoons, and is equivalent to about a battalion in strength.

(4) Veterinary Company

This is approximately a company in strength, responsible for evacuation and care of animals, and keeps a number of extra horses on hand for immediate replacement.

(5) Military Police

This is approximately the size of a large platoon, equipped with motorcycles for traffic supervision in the combat zone and the theater of operations.

(6) Field Post Office

Handles mail for division.

[redacted]

Notes on the Company Trains

a. Supply Wagons

The German trains (Trosse) usually consist of three parts, namely the Gefechtstross (combat train), Verpflegungstross (ration train) and Gepacktross (baggage train).

These three units are found in organizations of company, battery or troop strength. The transportation of these three trains belongs organically to the company. Taking the normal German rifle company as an example we find the following:

Combat train:	Two wagons, each drawn by two horses One field kitchen drawn by four horses
Ration train:	One wagon drawn by two horses
Baggage train:	One truck usually three-ton One motorcycle.

b. Combat Wagons

In addition to the three trains there are combat wagons which stay with the company in combat while the trains are normally in rear positions. The combat wagons or Gefechtsfahrzeuge consist of three platoon carts and one company wagon for ammunition. Each platoon cart is drawn by one horse and consists of two infantry carts coupled together. These carts carry the machine guns and mortar of the platoon when combat is not imminent. Ammunition, tools and camouflage equipment are also carried. The company wagon for ammunition carries a reserve of ammunition, explosives, grenades, wire, camouflage material, the antitank rifles etc.

c. Load Distribution

The wagons in the trains carry the following:

Two wagons of combat train carry packs of the men, reserve ammunition which may be on hand; oats for horses may be carried. The field kitchen of the combat train carries iron rations and current rations. The ration wagon of the ration train carries rations and reserve iron rations. The baggage truck of baggage train carries spare baggage of company.

d. Chain of Supply

Normally the trains receive ammunition and equipment from the light infantry column of the regiment. The ration train receives rations from ration train II of the battalion..

The light infantry column of the regiment and ration train II of the battalion receive their supplies from division (the division trains and the butchery and bakery units).

e. General

Units other than foot infantry, such as motorized company trains are the same (combat, ration and baggage) but have motorized vehicles. Some companies which are motorized, as is the case in the engineers, have a combined ration and baggage train (1 truck).

In general, it may be said that companies which engage in combat will have the three-part trains and the necessary combat wagons to accompany the troops.

The senior NCO of the company (Hauptfeldwebel) is responsible for the wagons of the trains. There is also a leader of the combat wagons and a leader of the combat train.

MEDICAL

15. NOTES ON MOBILE SURGICAL UNITS IN THE MIDDLE EAST

The following article is based on some observations relating to certain questions about the proper functioning of these units in the Middle East as published in the June 1943 issue of the Military Review, Command and General Staff School. The original source is given as the Journal of the Royal Army Medical Corps, January 1943.

* * *

a. General

Mobile surgical units of all kinds should be flexible in themselves and should be handled freely and flexibly. They should be equally capable of working at the base hospitals or in the forward combat zone and they should be distributed according to the needs of the situation. If a particular corps is suffering heavy casualties, a dozen teams may be needed for a few days. At other times a couple of teams can easily cope with all the work. In very quiet times there will be very little work at all in the forward combat zone; at such times most teams will be better employed at the base. Should a battle be about to start it is easy enough to push forward a dozen teams in a couple of days. In battle each team can do general work as required.

[redacted]

b. The Question of After-Care

Is the team to care for its own patients, its own tentage and have other necessary equipment and personnel? One opinion is that the team should not be required to carry accommodation for patients. It means extra transport and work when the team's energies should be devoted solely to treatment of patients. It is thought that the team should be responsible for the immediate post-operative care of its patients and should have its own nursing orderlies trained to this work.

c. Personnel of Surgical Teams

There is room for two types of teams in the forward combat zone; the extremely mobile team running one table, and the rather less mobile team running two tables, but of more than twice the capacity and very economical in personnel and equipment.

d. What is the Ideal Theater Accommodation?

It is not safe to count on finding buildings. Should operations be done (1) in a tent; (2) in a pent-house built round a truck, or; (3) inside specially equipped trucks? The great advantage of operating within the vehicle is the speed of getting to work, and of packing up. The task of packing up is far more important. You may have plenty of time to pack up and "beat it" if the enemy is approaching. But the first warning may be a shell in the camp, and in that event five minutes may be all the time one has to get going. Tanks move fast! The trouble about the few units possessing actual operating trucks is that the vehicles are far too small. In one unit the anesthetist said that it was sometimes necessary to anesthetize the patient before he could be got inside the vehicle and placed on the table. Vehicles should be expandible so that the floor space can be quickly doubled. Such a vehicle, plus a similar vehicle fitted as a sterilizing truck, could be joined back to back. This arrangement would give space enough to run two tables at the same time.

The alternative to such mobile theaters may be the specially designed pent-house tent built round the truck. The truck itself does not require elaborate fittings. Such as there are should be made accessible from the outside so that, when the pent-house is erected round the truck, equipment and supplies are readily and easily available. There is an Australian mobile surgical unit truck which embodies certain good points on these lines. The main feature about the construction of the vehicle internally is that all the fittings, cupboards, shelves, etc., are made of metal or metal-covered ply-wood, combining lightness and slimness with great strength and freedom from warping.

Trailers are a mistake for they are the very devil on narrow roads and in the desert. On narrow roads they won't go around the bends and in the desert the bumps are always breaking the couplings.

e. Other Points Concerning Transport

It is very bad policy to overload vehicles. In bad country it is unsafe. If

[redacted]

a vehicle is loaded to the roof, packing and unpacking take twice as long and, if a particular article is required in a hurry, it is always at the bottom of the pile.

Conclusions

If an ideal unit were to be designed, it is thought that the expandible trucks, one as an operating room, the other as a sterilizing room, and the two-table system with two surgeons would be best. And if that were not obtainable the single-team operating truck for the most advanced sporadic work and the two-table pent-house arrangement for the heavier work a little further to the rear would be most desirable.

ORDNANCE

16. AXIS USE OF SKODA AA/AT GUN

Detailed information is now available concerning the Skoda 75/49 AA/AT gun which has appeared recently in the Italian army. This gun may be designated "75/50" by the Italians. Characteristics of the weapon are:

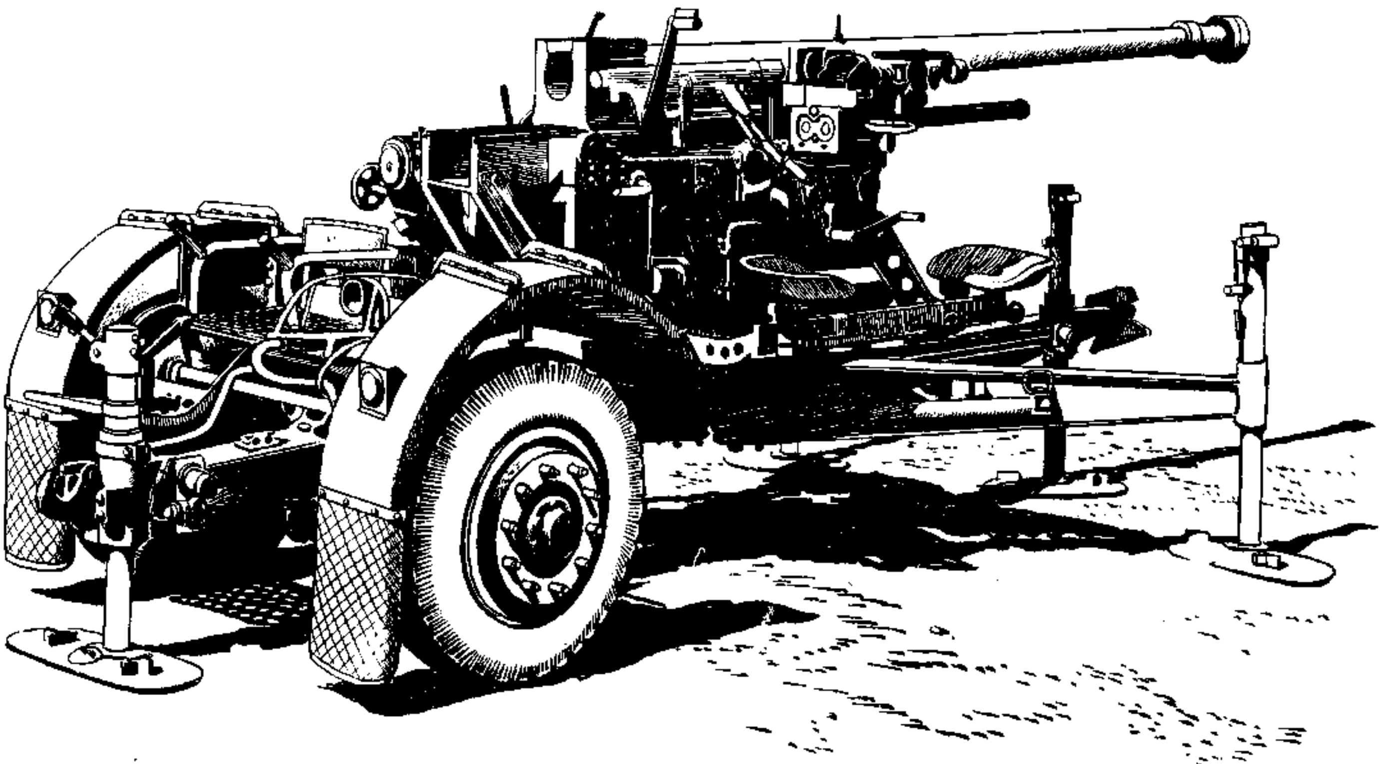
Muzzle velocity	2,690 fs
Maximum horizontal range	16,150 yds
Maximum vertical range	10,000 yds
Practical rate of fire	20 rpm
Weight in action	2.76 tons
Weight in draught	4.13 tons
Elevation	0° to $+85^{\circ}$
Traverse	360°
Weight of complete round	25.7 lb
Weight of shell	13.9 lb

For transport, the equipment is carried on 2 two-wheeled bogies at the front and rear respectively. There is a superstructure with a seat on the rear bogie to permit a crew member to operate the bogie brake.

The bogies are detachable and two hinged platform legs can be swung outward at right angles to the central member to form the platform. There is a levelling jack at the end of each leg and at each end of the main girder.

The piece is fitted with a muzzle brake. The breech block is of the vertical sliding type, opening downward. It closes automatically after a round has been fed into the chamber. The buffer and recuperator are slung under the piece. Documents give the elevation as 85° although examination of the numbering on the elevation arc suggests that this is graduated in sub-divisions of 20 mils and divisions of 80 mils up to 1,280 mils (71° 53′). The piece is elevated on two toothed arcs between the trunnions, compensation being by two cylinders housing springs attached to the cradle by wire cables.

[redacted]



THE SKODA 75/49 AA/AT GUN

Receiver dials are fitted. A leaf and blade open sight is integral with the piece. A Czech ZRz dial sight is fitted, the horizontal graticuling being in 5 mil divisions up to 20 mils on either side of the single vertical graticule. Magnification is low, and in a captured piece optical quality was bad. There is an electric graticule illuminator for night firing. This sight is protected by a grid when a tarpaulin or camouflage net is covering the equipment.

Three men are required to lay the gun. The gunner for direction and the No. 1 roughly for elevation. These men sit on the right and left, respectively, of the piece, facing the line of fire. The No. 2 man, who faces the gunner, completes the accurate elevation of the piece, sighting through an eyepiece on the other side of the telescope.

17. TESTING ANTIAIRCRAFT GUN BARRELS IN COMBAT AREAS

Modern antiaircraft guns are more than mere engines of destruction: they are complicated pieces of mechanism that require constant care and supervision. The following data on the maintenance of antiaircraft guns in the combat areas are taken from a translation of an article appearing in a German publication.

* * *

The gunners of the antiaircraft batteries watch the barrels of their guns with the same diligence that the infantryman does his rifle. But this care does not suffice to preserve that fine precision which is the essential thing in the case of the antiaircraft gun. From time to time the initial velocity valves must be measured and tested. It will be remembered that velocity expresses the ballistic velocity at zero meters, that is, on leaving the barrel of the gun. This must be very familiar to the gun commander.

It is necessary to know the initial velocity value of each gun in order to accurately fire the guns so as to have the shells burst in a definitely prearranged target area.

There are fixed stations in Germany for the measuring and testing of the initial velocity valves and in combat areas there is a motorized "initial velocity detail" which goes from one antiaircraft regiment to another to test every gun.

Magnetized projectiles are fired through two coils that are constructed at an accurately measured distance from the barrel of the gun. The time needed by the projectile to go from the first to the second coil is determined by the "Boulanger apparatus", two of which, in a special trailer, are attached to the initial velocity testing detail. As the projectile passes through the coils, its magnetic field generates a magnetic impulse which (over a relay) releases two

[redacted]

falling weights, one after the other, in the Boulanger apparatus. The second and smaller weight activates an impact measurer which makes a notch in the first weight. The height of the fall is measured by a gauge. By these measurements the existing initial velocity value for each gun is determined.

18. JAPANESE 12.7-MM (FIXED MOUNT) AIRCRAFT MACHINE GUN

Examination of a 12.7-mm aircraft machine gun* which was taken from a Japanese Mitsubishi Type 100 bomber shot down in the Chebra area of Assam shows that while this weapon is somewhat similar to and evidently was designed on the lines of the U.S. Browning aircraft machine gun fixed mount, cal. .50, M1921, (accompanying sketches showing comparison) interchangeability of parts between the Japanese and American weapons will result in malfunctions because of looseness in fitting.

The 12.7-mm Japanese aircraft machine gun is recoil-operated, assisted by a muzzle recoil booster. It is air cooled and belt fed. The gun examined was manufactured in October, 1942. The following general description applies to both Japanese models, 389 and 486.

Weight (unmounted)	51 1/2 lbs
Method of feed	belt
Overall length	49 in
Length of barrel	31 1/2 in
Number of grooves	7
Rifling	uniform lh twist

The gun captured in Assam, Model 486, is belt-fed from the left while a similar gun, Model 389, also a captured weapon, is belt-fed from the right. There is non-interchangeability of feed from right to left.

Selective feed is not provided. Each gun is designed to feed from one side only, right or left. Ammunition found with the Model 486 gun indicates that a metallic disintegrating link belt is used. Very few parts are marked with the gun number.

The trigger assembly is so adjusted that the weapon may be fired from a closed bolt or open bolt. These "various" phases may be operated from remote control but change from one phase to another requires manual adjustment.

The Japanese weapons fire a smaller cartridge than the U. S. cal. .50 Browning. Therefore the receiver bolt and main assemblies are smaller and non-interchangeable.

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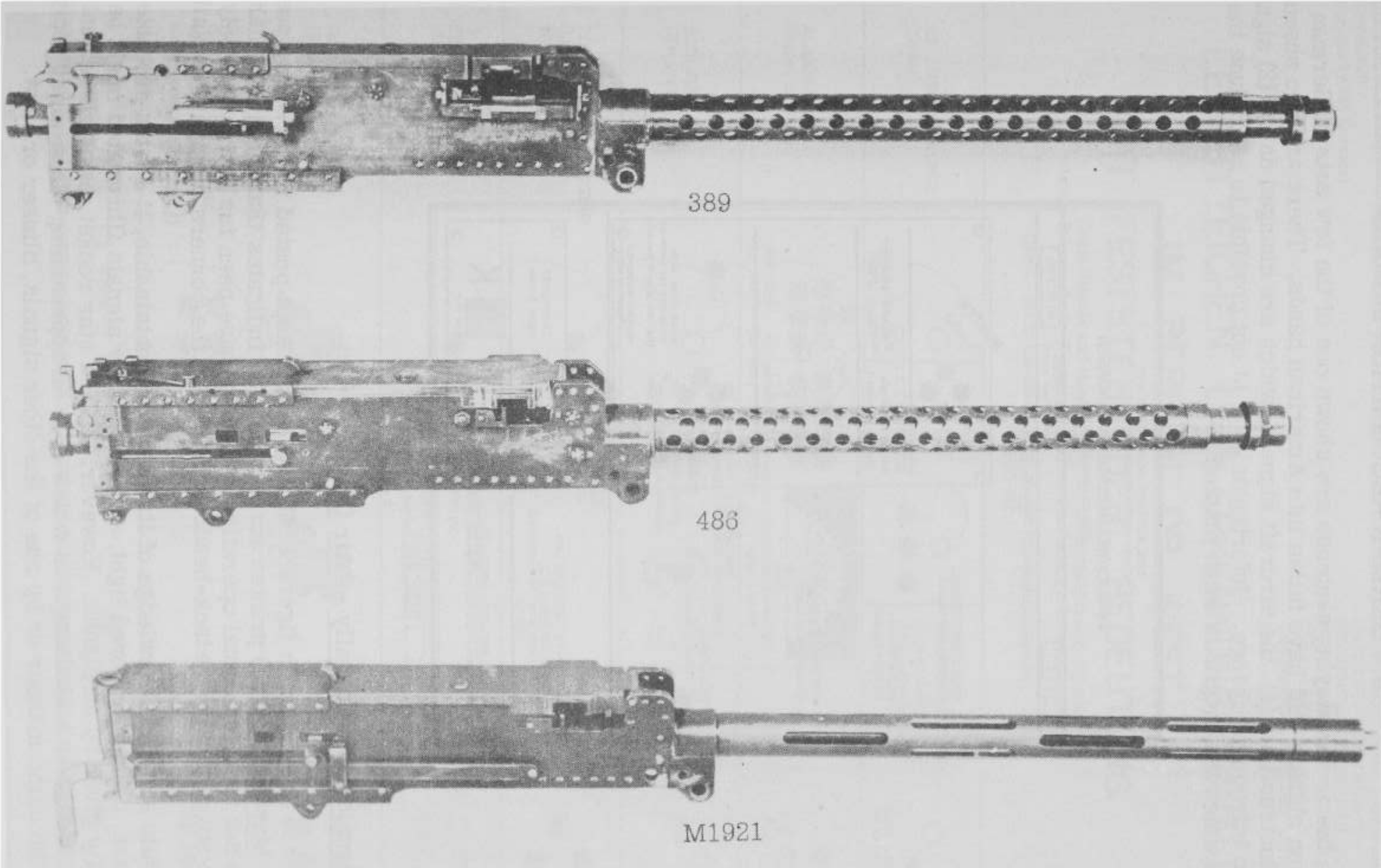
*The Japanese 12.7-mm aircraft machine gun was first mentioned in Tactical and Technical Trends, No. 25, p. 4 in an article entitled "A New Type Japanese Medium Bomber."

[redacted]



COMPARISON OF JAPANESE AIRCRAFT MG's WITH BROWNING M1921

[redacted]

19. GERMAN RECOGNITION SIGNALS

In the accompanying sketches are shown one of the few sets of German recognition signals that have fallen into American hands. There are two sheets of these instructions (1) the aircraft signals, which are changed daily; (2) signals subject to infrequent change. Unfortunately, it is not possible to reproduce the colors in which the originals were printed.

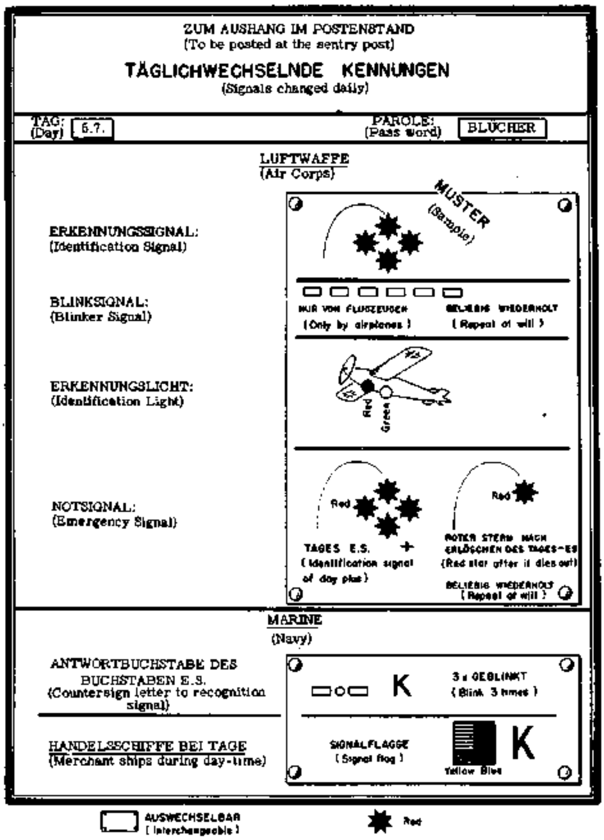


FIG. 1

a. Signals Changed Daily -- Air Corps

These are shown in figure 1. This sheet is kept posted in the sentry post. The word Muster (sample) printed across the face indicates that this particular sheet was not used for actual operation -- it may have been for instruction only as is also suggested by the tack-heads indicated in the corners of the inner outlines.

While accurate knowledge of its use is not obtainable, it seems probable that the star, blinker, colored light, and emergency signals illustrated might be customarily given by airplanes. However, the red star rocket may well be sent up by ground troops as a challenge, in which case an approaching plane would reply in either the same manner or by one of the other signals, blinker or light.

[redacted]

NUR FÜR DEN DIENSTGEBRAUCH.
(Restricted)
(For use by the Service)

DARF NICHT ÜBER DEN KOMPANIE--
GEFECHTSSTAND HINAUS
MITGENOMMEN WERDEN UND NICHT
IN FEINDESHAND FALLEN.
(Not to be taken beyond the
Company Command Post and not to fall
into enemy hands)

LEUCHTZEICHEN UND ERKENNUNGSSIGNALE IM BEREICH OB. WEST MIT FESTSTEHENDER BEDEUTUNG.

(Light Signals and Identification (or acknowledgement) Signals
in the Sphere of the Western High Command having a constant meaning.)

(Note - ES in the chart below means Erkunningssignale)

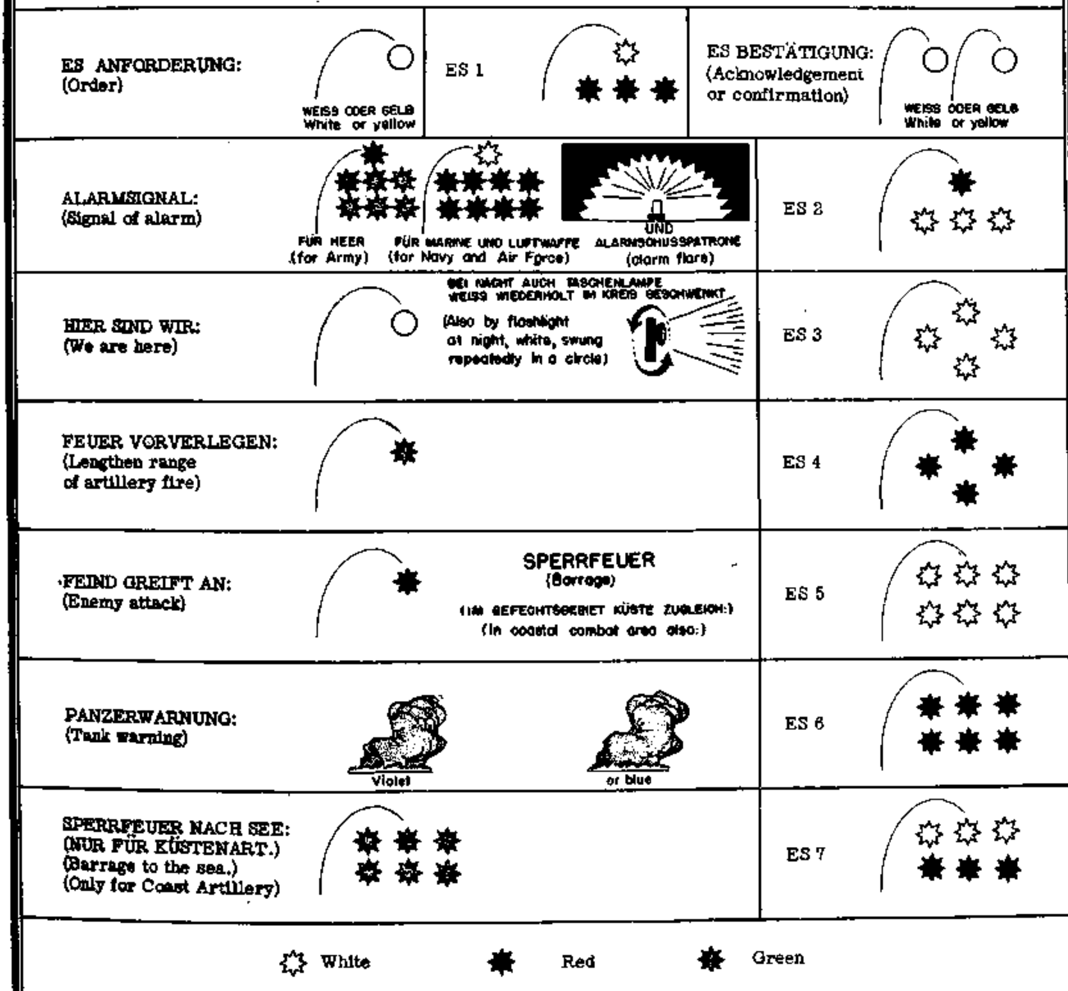


FIG. 2

[redacted]

b. Permanent Signals

ES-1 in figure 2 may be interpreted as a challenge to an approaching unit -- air, ground or afloat. The one white rocket is equivalent to, "Halt -- who's there?" The approacher replies with one white and three red -- the identification signal meaning, "Friend," and the challenger replies with two white rockets, "Pass friend." The interpretation of the other signals 2 to 7 are simple, the acknowledgement, ES, meaning, "Signal received."

GENERAL

20. DRINKING WATER FROM THE RATTAN VINE

a. General

Officers returning from the S. W. Pacific area report that good drinking water is hard to find in the jungle. A source of excellent water exists in many jungle areas in the shape of the rattan vine, from which a copious water-supply may be drawn by cutting off a section of the vine and allowing the water to run out of the severed section into a canteen cup. While the fact that this vine will supply water, together with a description of the rattan palm-vine, appeared in Technical Training Manual 10-420*, page 16, a more complete description of the plant and its potentiality as a supplier of good drinking water appears to be desirable. The information upon which this account is based was furnished through the courtesy of Dr. E. H. Walker of the Smithsonian Institution and Dr. E.D. Merrill, Director of the Arnold Arboretum, Harvard University.

b. A Word of Caution

While other tropical vines produce drinkable water, and possibly sap from most vines that do not produce a milky juice may be drunk in extreme emergency, they are not to be recommended unless used by local natives. All rattans, however, are safe, and while the rattan vine-palm is usually found in the higher jungles, it occurs also in coastal jungles where most of our forces are now operating.

c. The Rattan Palm

There are many different kinds of rattan palm; all are climbing palms, with vine-like characteristics, see sketch. It will be noted that out of the tips of the palm leaves, the central stem is prolonged into a vine which may be from 100 to 250 feet long, and vary in thickness from the diameter of a pencil to 2 1/2 inches. These vines, as many a soldier knows to his sorrow, are supplied with very sharp, hard, claw-like teeth similar to rose thorns, growing out of their shoots or tendrils, or from the leaf stems. Incidentally, the lower foot or two of the trunk of the palm contains some starch. These lower parts, which are slightly thickened, may be roasted and the baked starch "chewed out." Rattan vines may run along the ground or climb high on jungle trees. Those found low and in the shade give a

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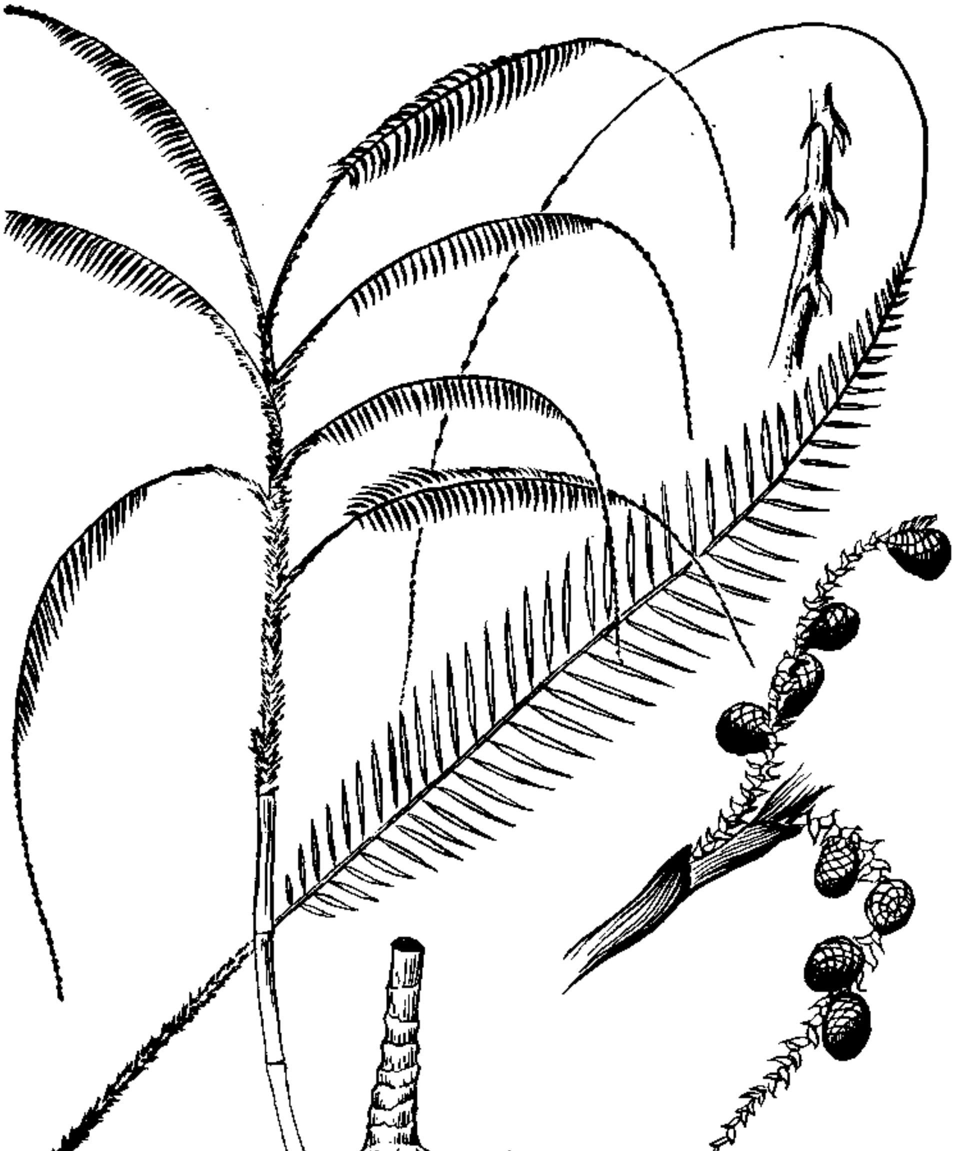
*Published by the War Department and known as Emergency Food Plants and Poisonous Plants of the Islands of the Pacific.



RATTAN PALM-VINE

[redacted]

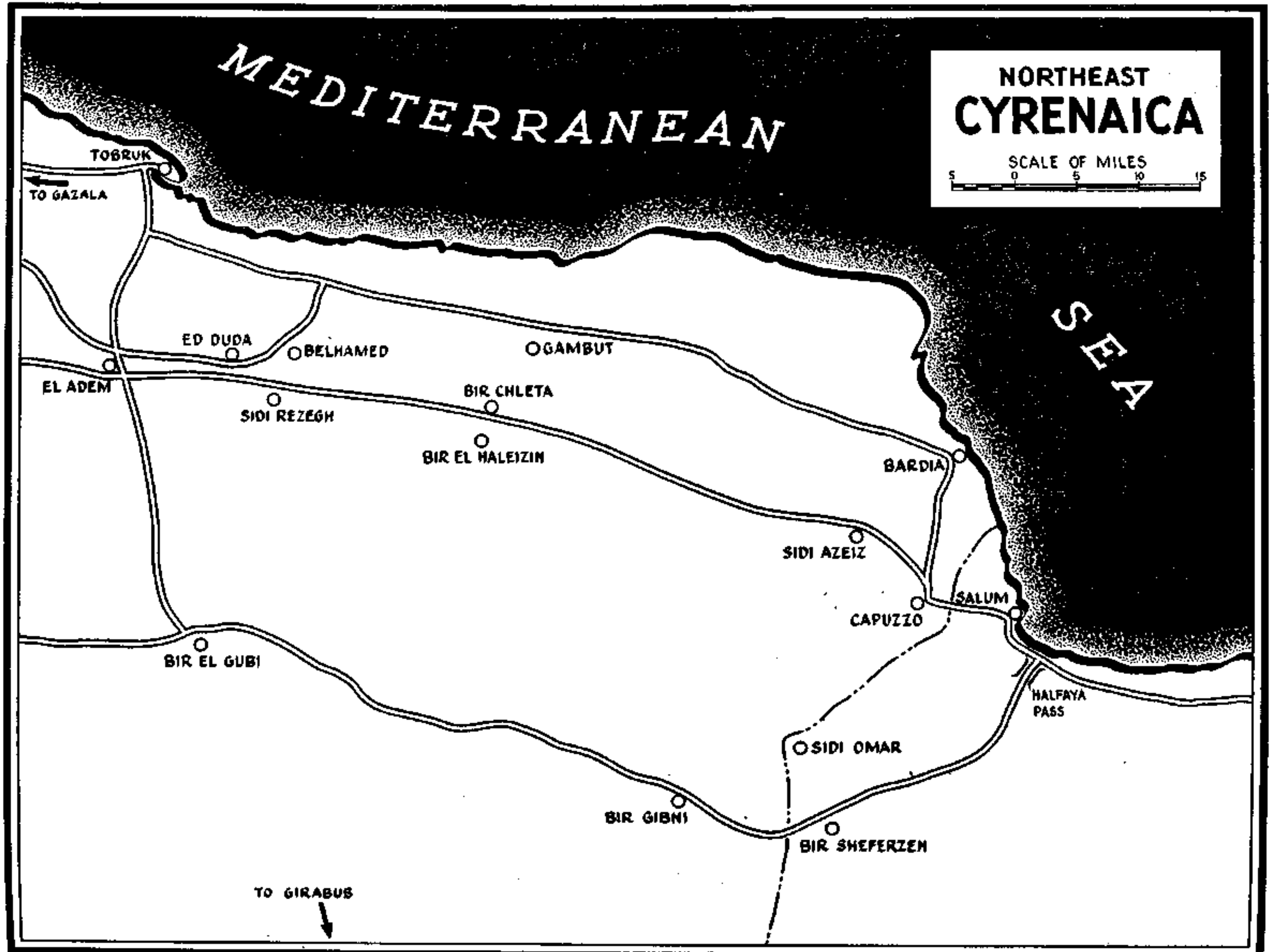
cooler water than the vines exposed to hot sunlight.

d. How To Tap the Vine

To tap the vine, chop off a thick section from two to eight feet long, making the upper cut first. Never make the lower cut first. Hold the cut segment, butt end down over a canteen cup, when the sap will begin to drip or flow out. When the flow ceases, cut off a foot or more from the top end--more water will trickle out. This process may be repeated until there is no more water left in the stem.

SECTION II

LESSONS FROM THE NEW ZEALAND DIVISION OPERATIONS IN CYRENAICA


NORTHEAST
CYRENAICA
SCALE OF MILES
5 0 5 10 15
MEDITERRANEAN
SEA
TOBRUK
TO GAZALA
ED DUDA
BELHAMED
GAMBUT
EL ADEM
SIDI REZEGH
BIR CHLETA
BIR EL HALEIZIN
BARDIA
SIDI AZEIZ
SALUM
CAPUZZO
HALFAYA
PASS
BIR EL GUBI
SIDI OMAR
BIR GIBNI
BIR SHEFERZEN
TO GIRABUS

[redacted]

LESSONS FROM THE NEW ZEALAND DIVISION OPERATIONS IN CYRENAICA

Preparations

A brief reference at the outset to the events leading up to the participation of the New Zealand Division in the campaign in Cyrenaica will serve to give background material for the report.

Despite the fact that the New Zealand report on which this article is based, is dated 4 January 1942, it is thought that its value, especially the lessons derived from the combat experiences of the Division, may be profitably reviewed at this time.

The Division had met with reverses in Greece and Crete. In September 1941, fully equipped and completely mobile, it had concentrated at Bagush to train for a role in the second Libyan offensive. There were six weeks in which to train for the specialized type of fighting in desert warfare.

Training methods were used for the most difficult operation to be undertaken. For example, an attack on a heavily defended fortress covered by wire and mines served to present the greatest difficulties. Two dummy fortresses were prepared, wired, and covered by mine fields. A series of exercises was then carried out to capture them. Each infantry regiment supported by the full divisional artillery and a "mock-up" of battalion of "I"* tanks did the attack. Also a night approach march of about 30 miles was carried out without any vehicle lights. The element of surprise was also sought. The attacking force deployed by dark and attacked as soon as possible after the artillery had registered at the first light. Infantry in personnel carriers supported by tanks advanced under cover of a barrage of high explosive and smoke. A point of entry was secured, engineers clearing a lane through the mine fields; tanks exploited the breakthrough while infantry, field, antitank and antiaircraft artillery followed rapidly to consolidate and prepare for the counterattack. These and other detailed preparations paid dividends later on under actual battle conditions.

Further measures taken to prepare the Division for combat eventualities are contained in the following extracts.

* * *

While we [the New Zealand Division] were busy with our training plans and running in our new equipment, detailed preparations for the operations were being dealt with by Corps and Army Headquarters. By 6 October, plans were made. The Army Commander held a conference and gave divisional commanders details of the outline plan. Briefly, Eighth Army were to take Cyrenaica, the immediate object being the destruction of the enemy's armored forces by our own armored forces. We were estimated to have a numerical superiority in tanks of five to four. The plan was that our Armored Division should threaten the enemy investing Tobruk and force them to fight a decisive battle on terms that favored us.

*Infantry tanks--slow-moving, 16-ton "Valentines" and 26-ton "Matildas."

[redacted]

Plans for the relief of Tobruk depended on success in the armored encounter. The Eighth Army was divided into three groups, 30th Corps, 13th Corps, and the Oasis Group. 30th Corps consisted of the 7th Armored Division with the 22nd Armored Brigade [U.S. regiment] attached and the 22nd Guards Brigade [U.S. regiment] 1st South African Division (less one regiment), three battalions of artillery and one antitank battalion. Its role was to defeat the German armored forces as already mentioned and relieve Tobruk. 13th Corps, which comprised 4th Indian Division, New Zealand Division, 1st Army Tank Brigade, one extra field battalion, and one antitank battalion, was to advance north and isolate the enemy's forward fortress line and later mop it up from the west. 13th Corps was not to be committed, however, until the armored forces came level with it on an east to west axis. 22nd Armored Brigade, detached from the Armored Division, had a dual role, viz., to protect the left flank of 13th Corps from armored attack and also to intervene if there was a general tank battle. The Oasis Group was a composite column which was to deceive the enemy by moving from Biarabub on D-1, fixed as 18 November.

The RAF plan for the period up to the beginning of the offensive was to restrict enemy reconnaissance and to interfere with the enemy supply system on land and sea. After the battle started, they employed strong fighter sweeps to protect advancing columns and escort our bombers in their role of bombing the enemy supply system and communications as well as participating directly in support of the land forces.

By the beginning of November, our preparations were as complete as we could make them. As many officers as possible had been forward to see the country we were to move and fight across, and a large-scale model of Cyrenaica from the Egyptian border to Tobruk had been utilized to give all officers as vivid a picture as possible of the country in which we were likely to operate. Detailed intelligence reports had been circulated. Air support control exercises had been carried out. The very difficult problems of supply had been carefully considered. Nothing appeared to have been left to chance in the preparations for the Second Battle of Cyrenaica.

It was considered certain that Rommel would fight for Tobruk but there was considerable doubt as to where he would fight. There were two courses open to the enemy. Withdrawal from the fortress line Bardia-Halfaya-Sidi Omar to a strong position based on El Adem covering Tobruk; or, to decide to hold the fortress line on the preparation of which so much care had been lavished, concentrating their armored forces behind for a counterattack. Rommel was not, of course, an unknown quantity. Every bit of information about his record had been studied and we were quite ready for a war of rapid movement and bold tactics. Summing up the situation on 10 November there was still little evidence of any intention to withdraw from the frontier.

* * *

[redacted]

The lessons themselves as derived from the operations of the New Zealand Division are given special emphasis in the report of this campaign. There are the general lessons which will apply to any fighting against the Germans, lessons which prove and give added force to well-known principles of war. Some of the lessons apply particularly to desert warfare. The effect that topography has on tactics should not be overlooked. As the report says, "Our next campaign may lie in closer country, where our methods will be different and where the infantry soldier and the field gunner will have more important roles than has been the case in the desert fighting. We must not become obsessed with desert warfare."

Some of the outstanding lessons of the Libyan campaign are contained in the following portions taken from the New Zealand Division report.

* * *

a. Fitness, Efficiency and the Will to Win

The degree of success a unit or formation achieves in battle depends above all else upon the will to win. There is a time in all battles when the men on both sides are exhausted. It is the man who can hold on longest and who fights with the greatest determination who will win. The will to win requires constant attention. It is made up of many factors, two of the most important being physical fitness and confidence in the arms we use. In both of these we are superior at present to the German infantry.

Physical fitness is difficult to achieve. I can see no substitute for long marches and digging. Motorization is the enemy of physical fitness and the more we become motorized the more need there is for march training. Personnel must be trained to the standard we have always set of 40 miles in 24 hours.

During the recent operations the rifle and machine gun were relegated to a secondary role by the gun and the tank [at el Alamein they exercised a considerable influence on the course of the battle] . In our next campaign we may be fighting in mountainous or close country; the rifle and the machine gun as well as the field artillery, will then have added importance.

Wherever we may be destined to fight our training should be based on these two fundamental principles:

PHYSICAL FITNESS OF ALL PERSONNEL;
PROFICIENCY AND CONFIDENCE IN THE USE OF WEAPONS.

b. Surprise and Training

Surprise is still the outstanding factor in achieving success. This fact was proved on many occasions during the operations.

In Libya we started the campaign well aware of the maneuverability of a mobile division and knowing that we could move 35 miles in the dark without lights, hit a given spot, deploy, shoot in our field guns, and two and a half hours after first light, stage a coordinated attack with "I" tanks under a full artillery plan.

In Crete we had already learned by experience that provided there were no wire entanglements, the enemy could be turned out of any position at night by attacking with the bayonet.

This knowledge that we could move long distances and fight at night proved to be of the greatest assistance in all our planning and gave us a great feeling of confidence when carrying out our operations.

In the move north to cut off the fortress line and in the battles around Tobruk, wherever we used our pace, combined with movement at night, we always caught the enemy unprepared. Success was immediate and casualties often extremely light.

As surprise is the most important element of success, we must consider how it is to be obtained in all our training schemes. There are many well-tried methods of achieving surprise. Night attacks and night advances often offer the best chances. It is also true that night operations require most careful training.

TRAINING, THEREFORE, IS THE FIRST STEP TO ACHIEVING SURPRISE.

<u>c</u>. <u>Attack</u>

The following are some of the lessons of the attack in desert warfare:

(1) Once again it was shown that the attack against a properly organized resistance must have either the cover of darkness or an adequate artillery support. This applies whether tanks are used or not. In every case where tanks or infantry were committed in daylight without sufficient covering fire, they had very heavy casualties. On the other hand the moonlight attacks on Belhamed, Sidi Rezegh and Ed Duda were all successful against superior enemy forces. The daylight attack in the area between Belhamed and Sidi Rezegh was also successful as it was possible to cover the attack with 25-pounder and machine gun concentrations fired ahead of the leading tanks.

(2) In an attack where an enemy counterattack with tanks may be expected our antitank guns must be brought well forward, manhandled if necessary, to protect our tanks during all stages of the attack. The Germans were skillful at this.

(3) Full use must be made of smoke to blind the enemy antitank guns in depth.

(4) On at least one occasion the Germans attacked with tanks on a different axis from their infantry. Although this type of attack is more difficult to stage

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and is therefore somewhat deprecated in the textbooks, it is much more difficult for the defenders to deal with and is worth studying.

(5) Motorized infantry can and should use the speed of their vehicles to the full in attack to gain surprise. An extreme example occurred on the Gazala Front against Italians where our infantry came up to within a hundred yards of the strong enemy position and captured it with slight casualties.

d. Defense

One of the lessons of our battles was that where the holding of ground was not important the best defense was undoubtedly to attack. Being tied to the ground in a fortress seems to have a paralysing effect upon the occupants. In Bardia and Halfaya 14,000 of the enemy were kept upon the defensive for a fortnight by three battalions of infantry and two batteries of artillery. Mobility and the power to attack are the best form of defense.

e. Air

The Libyan Campaign was our first experience of air and armored support on an adequate scale. With the former we need not concern ourselves here except to note that the impressive superiority of the RAF in Libya must be borne in mind when considering the lessons of the campaign. Our understanding of air support has, as a result of the experiences in Libya, advanced considerably and improvements in communications will enable air support to be speeded up.

f. Tanks

The tank is the German Army's primary weapon. With it the Germans are formidable, without it they are lost. In the recent fighting it was only by clever handling of their tanks that they escaped complete defeat. We must study methods of overcoming their tanks. We have much to learn from the Germans in handling tanks in battle and also from the German methods of coordination of tanks with artillery, antitank guns and infantry. Depending as they do on the tank, their policy aims at producing the largest number of effective tanks at the decisive moment in a campaign. They have produced a satisfactory tank from the mechanical point of view and they understand the value of gunpower. They have a most efficient organization for maintenance and quick recovery of tank casualties. Finally, they appear to avoid action unless the conditions are favorable, thus keeping their casualties much lower than ours.

We had many examples of the German use of tanks. They will not attack without close support of artillery, antitank guns, machine guns and infantry. In both attack and defense they have a very high proportion of antitank guns, around which the tanks maneuver. Even 88-mm antitank guns are brought forward by tractors with tanks. The whole tempo of the German tank attack is slow, the tanks moving from one hull-down position to another. The difficulties of our gunners were further added to by the direction of attack which was almost always with the sun behind the tanks. The enemy also took advantage of smoke and dust

[redacted]

raised by artillery bombardments. In some cases antitank guns and machine guns were taken forward with the first wave to give close support. We can use these German tactics in our training. The following are some of the points which have arisen from our experience:

(1) We must always give the maximum supporting fire to armored fighting vehicles in attack.

(2) If, during an attack, antitank fire is very heavy the tanks should if possible occupy hull-down positions and the infantry should be prepared to go through the tanks to shoot up the antitank guns.

(3) In the desert tanks can and should be used in attacks at night, especially during moonlit nights. They were used most successfully in the moonlight attack on Ed Duda. The commander who loses tanks by bad tank tactics may capture the objective, but lose the whole battle for want of tanks later to repel enemy counter attacks.

(4) It will often be necessary to give active cover to the tank recovery personnel on the battlefield.

(5) New Zealand Division was very inexperienced in the actual capabilities and handling of the army tanks as we had not been able to get tanks during the training exercises. Before any further operations are carried out tanks and infantry should train together.

g. Reserves

In desert warfare the demand to hold all the ground considered necessary for the security of a force frequently extends that force to the utmost, but one of the lessons of our fighting in the Sidi Rezegh-Belhamed area is that a commander must maintain an adequate reserve even at the expense of giving up ground which it is thought desirable to hold. During the critical days of that fighting the only divisional reserve was one squadron of army tanks and one squadron of divisional cavalry.

h. Dispersion

During training prior to the campaign the question of dispersion was discussed. Against air attack dispersion to 200 yards between vehicles was laid down as normal. Such a degree of dispersion produces a frontage in desert formation which cannot be adequately protected against tank attack. The two conflicting requirements of dispersion against air attack and concentration against tank attack must therefore be weighed up at all times, the decision depending upon the relative danger from each type of attack. During the approach march to the frontier a dispersion of 200 yards was maintained although no air attacks actually took place. Once the frontier was crossed distance was reduced to 100 yards as the enemy air force had been inactive and there was a possibility of tank attack. This degree of dispersion proved in part to be satisfactory against the only air

bombing attack which took place.

While in defense in the Sidi Rezegh-Belhamed area distances between vehicles were still further reduced owing to the small amount of cover available and it was found that vehicles at 50 to 60 yards interval did not suffer undue casualties during artillery bombardment. No enemy air attacks took place during that period.

i. Night Moves

The three night moves during the approach to the frontier were all successfully carried out, using green lights at intervals of about 1,000 yards. Lights were placed by Provost Company in daylight, the line being reconnoitered and fixed by a small sapper party. It was found during the later operational moves that navigation by compass at night was carried out very accurately without vehicle lights of any description even when there were two or three changes of direction as in the move of 20th and 21st Battalions and Divisional Headquarters to Bir Chleta and the last move of the Division of over 40 miles to Bir Gibni. It is advisable, however, for the leader to have a light at the back of his car which can be seen.

j. Antitank Rifle

Although the antitank rifle still has its uses, it is no longer effective for the purpose for which it was designed and no case occurred of an antitank bullet putting out of action a German tank. It is essential that infantry should have a weapon of their own capable of penetrating modern tank armor at some distance (at least 500 yards). The weapon must be both mobile and inconspicuous and should be included in the battalion. No reduction should be made in the number of guns in the antitank regiment. The number of infantry antitank guns required will depend to some extent on the performance of the weapon produced, but it is considered that a minimum of eight is required in each battalion.

k. The 25-Pounder (88-mm)

The 25-pounder is an excellent weapon and much superior in shell power to the German and Italian field guns encountered during the campaign. On occasions when troops were attacked by small groups of tanks, fire was withheld down to ranges of 800 to 1200 and very good results were achieved. Until we are provided with proper antitank guns we must speed up ammunition supply to our field regiments.

l. Intelligence

Within the Division the flow of information both upwards and downwards has greatly improved and it was found satisfactory, even under the worst conditions. However, during the battle period information regarding troops on our flanks was only satisfactory on the rare occasions when we were actually in touch with them.

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m. Codes

The very elaborate and unwieldy code system, produced before the campaign, broke down partly under its own weight and partly because it was frequently compromised by capture. The two essentials appear to be the time code and the map reference code and the latter could be simplified by using only the daily adder.* Apart from these two codes it is considered that messages within the Division should be either in cipher or in clear.

n. Conclusion

"To sum up: This campaign has shown again that the well-established principles of war still apply. Of all the factors which contribute towards success, surprise is still the most important. To achieve surprise we must be highly trained. We must train to reach the highest standard of efficiency in movement, in the use of weapons, and in cooperation with other arms. Training now is more necessary than ever. Success depends on the will to win of a fully-trained force at the highest degree of physical fitness."

*The meaning is not known exactly. Probably in U.S. usage it means "daily additive"--a prearranged code number-change.

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CORRECTIONS

ANTIAIRCRAFT

No. 33, p. 4: The British aerial dart gun and dart for the training of antiaircraft machine gunners were described, with suggestions as to the improvisation of a similar device. Although the article states that the U. S. Army has no dart gun, it has been learned that the M-2 rocket target (see TM 4-236, 29 September 1942) is used for the same purpose as the British employ the aerial dart, and, that as a representation of a plane in flight, it is far superior to the dart. However, it would appear that in isolated posts where rockets may not be available, an improvised dart gun would be a useful training device.

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SECTION I

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AIR

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1. ITALIAN SM-82

The Savoia-Marchetti-82 "Canguru", the largest of Italy's 3-engine aircraft, not only constitutes about 75 to 85 per cent of the Italian Air Force transport fleet but has been the only reported Italian plane in substantial use by the Germans. Recent reports indicate that some of these planes have been used by the Germans to evacuate troops from Corsica. A development of the SM-75, with deeper fuselage and a single fin and rudder of radically different design, it is a 4- or 5-place, 3-engine, low-wing cantilever monoplane with wings tapering moderately to rounded tips, and hydraulic landing gear. The fuselage is wide and deep, with 8 windows high up and 3 below along both sides. It has a wing span of 97 feet, 6 inches, a length of 73 feet, 6 inches, and a gross wing area of 1,290 square feet.

The aircraft is powered with 3 Alfa Romeo 128 RC 21 9-cylinder air-cooled radial engines, each capable of 860 hp at 6,900 feet altitude. The maximum speed is 205 mph at 7,000 feet, and 185 mph at sea level. Normal cruising speed is 172 mph at 10,000 feet, and economical speed, 155 mph. The service ceiling with a normal load is 17,000 feet, and the range is 1,160 miles or 6.8 hours.

Self-sealing tanks fitted into the wings have a total capacity of 928 U.S. gallons. Additional fuselage self-sealing tanks may be installed to hold 639 U.S. gallons, making a maximum fuel load of 1,567 U.S. gallons.

The armament consists of one 7.7-mm free machine gun in the forward fuselage with a 60° traverse, one 12.7-mm free machine gun in the hand operated dorsal position just aft of the cockpit, with a 360° field of fire, and two 7.7-mm free machine guns in the lateral positions, each capable of a 65° traverse. The airplane is not fitted with armor.

The "Canguru" is reported to be capable of carrying the following alternative loads:

(1) 75-mm gun with ammunition and/or one flame-throwing outfit with crew and equipment
(2) small tank
(3) 51 men with light automatic weapons
(4) a dismantled Fiat CR-42 fighter, which is carried with wings detached and stowed along the sides of the fuselage.

The SM-82 is well known for its four-day, 16,200-mile liaison flight from Rome to Tokyo and return in 1942. In 1939 it set a world's closed circuit distance record when it covered approximately 8,000 miles at an average speed of 143 mph remaining in the air for 56 1/2 hours. The aircraft has seen extensive service throughout all the various African campaigns.

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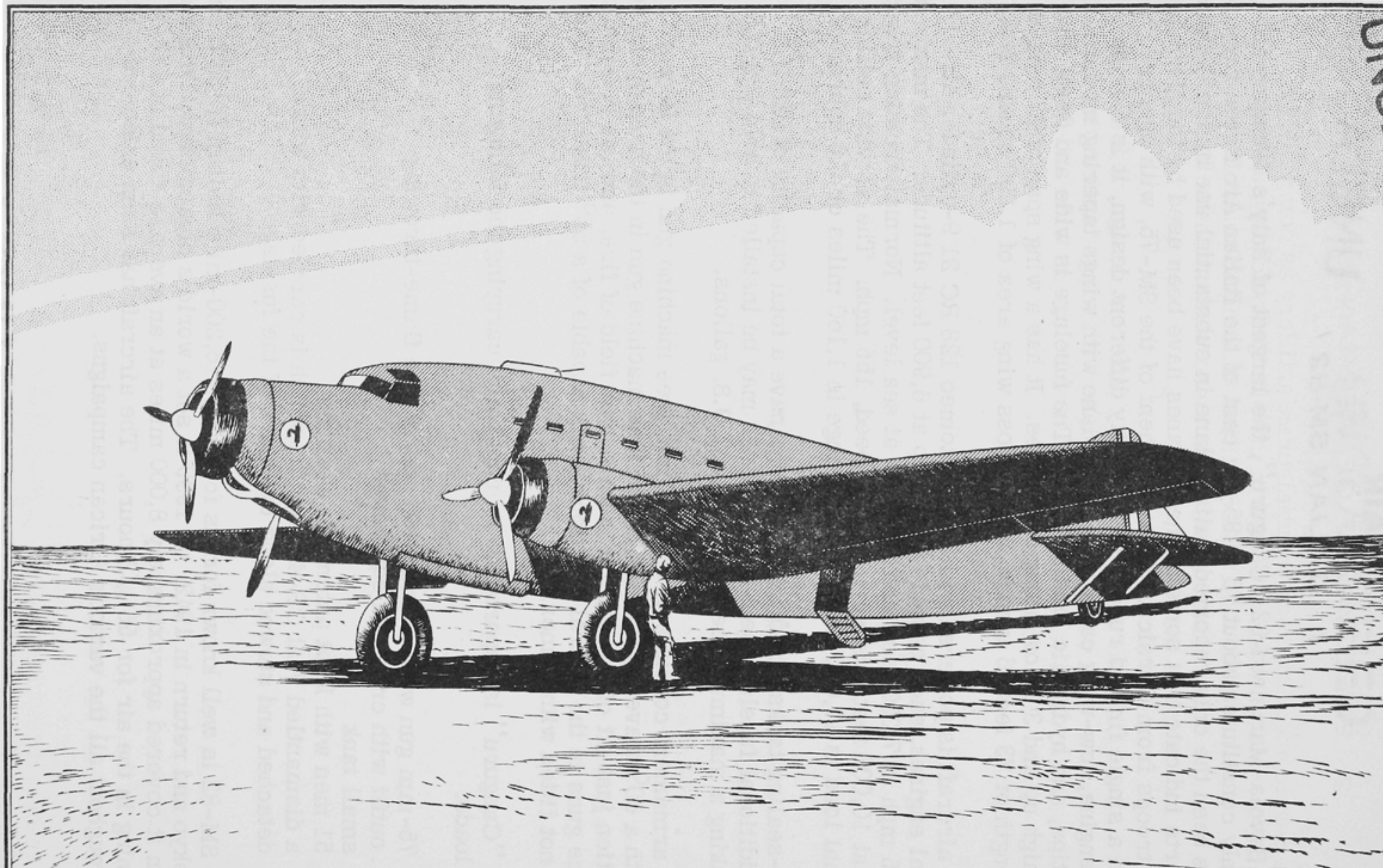

THE SAVOIA MARCHETTI S.M. 82 "CANGURU" BOMBER

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2. EMPLOYMENT OF GERMAN AAA

The development of modern antiaircraft artillery as compared to all other types of artillery probably has resulted in the most advanced type of weapon in this category. Because of its ballistic qualities, automatic controls and the technical excellence of the instruments used, these weapons have been of great tactical use in the hands of the enemy.

The following article taken from AFGIB (Air Forces General Information Bulletin) September 1943, describes some general principles underlying the methods of operation of these guns and also takes up the question of the performance characteristics of the various German types.

* * *

The term "Flak," as related to German antiaircraft, is an abbreviation for "Fliegerabwehrkanone," which means antiaircraft gun. However, in common parlance of the British and our own forces, Flak generally means the fire from such guns rather than the guns themselves. This usage is exemplified in such statements as that "Flak was intense and accurate at X feet," etc.

Like fighter aircraft, which constitute the other major hazard to operation of our planes over enemy territory, antiaircraft guns and gunnery have been constantly improved in their capabilities and effectiveness during the present war. This article attempts to present a general picture of the present status of German equipment.

German guns in common use against aircraft may conveniently be considered under three main classifications, namely: (a) machine guns and small arms; (b) light antiaircraft, consisting of automatic weapons; and (c) heavy antiaircraft, firing high explosive projectiles equipped with variable time fuzes. Each of these categories has its own zone of employment and major effectiveness. Assuming that the target aircraft flies within the horizontal range of the weapon, the altitude of the target mainly determines the effectiveness of each category of weapons for the particular case.

Aircraft flying over German-held territory at very low altitudes are apt to encounter heavy machine gun fire; and when over troops, to be also the target for everything available in the way of small arms as well. (see Tactical and Technical Trends No. 30, p. 6) It is standard German practice to send up a hail of bullets from every sort of weapon that can be brought to bear, and the concentration of fire from troop columns has been described as very heavy indeed. The German machine gun most commonly used is the air-cooled 7.92-mm (0.31 inch) gun. It has a maximum vertical range of about 8,500 feet, but the slant range for tracer observation is only about 3,000 feet and fire is effective only to about 2,400 feet. The rate of fire for short bursts may be as high as 1,100 rounds per minute, and ammunition for the antiaircraft role is usually fed in the ratio of

one tracer, two armor piercing, and two incendiary bullets.

a. Safest Flying Procedure

For aircraft which must fly well within the effective range of machine guns, it is generally considered that the safest procedure is flight at the minimum possible altitude--preferably 50 feet or less--taking every possible advantage of cover in the shape of terrain features, including hills and valleys, trees, and buildings. Speed, surprise, and evasive action are highly important, as is also the direction of the aircraft's attack. For instance, straight, lengthwise flight over a troop column is likely to be very unhealthy. It is evident that the gunner's problem is most difficult when he has the target in view for the shortest time, and must traverse his gun rapidly to follow it, allowing for corkscrewing changes of course and altitude by the plane.

German light antiaircraft guns--automatic weapons--include a 20-mm cannon corresponding to the Oerlikon or Hispano-Suiza; a 37-mm, somewhat similar to our gun of that caliber; a 40-mm Bofors; and a dual purpose 50-mm. The latter two are less commonly encountered, as some 70 per cent of the automatic weapons are 20-mm and some 20 per cent are 37-mm. In the antiaircraft role, these weapons fire high explosive tracer shells equipped with percussion and self-destroying fuzes.

The 20-mm has a maximum horizontal range of 5,230 yards and a maximum vertical range of 12,500 feet. However, the shells normally do not reach this altitude, as with 6-second self-destroying tracer ammunition they explode at about 7,200 feet. The effective ceiling for accurate engagement is considered to be about 3,500 feet. The theoretical rate of fire for the Model 30 is 280 rounds per minute, and for the Model 38 is 450 rounds per minute. Practically, these rates reduce to about 120 rounds and 200 rounds, fired in bursts of up to 20 rounds.

The 37-mm has a maximum horizontal range of 8,750 yards, and would have a maximum vertical range of 15,600 feet, except that the 14-second tracer ammunition self-destroys at about 13,800 feet. With 7-second tracer, the shells self-destroy at about 9,200 feet. As with the 20-mm the effective ceiling for accurate engagement is less than these figures, being about 5,000 feet. The theoretical rate of fire of the 37-mm weapon is 150 rounds per minute, which reduces in practice to about 60 rounds per minute for cartridges loaded in clips of 6 rounds each. High explosive shells of both the 20-mm and the 37-mm have an instantaneous percussion fuze which functions on impact.

The usual fire control equipment for German light automatic weapons is a gunsight with a computer mechanism on the course and speed principle, together with a separate stereoscopic range finder. Other sights are used in which the necessary deflections in azimuth and elevation are automatically calculated by an electric control mechanism that operates when the traversing wheels are moved. Forward area sights are attached for firing at very close range when a high rate of traverse of the weapon is necessary.

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The fire is corrected by visual observation of the paths of the tracers. The fact that such observation is correct only for the earlier and flatter portion of the trajectory accounts for the previously mentioned reduced figures for "effective" range. Beyond the "effective" ranges, the probability of a hit drops off rapidly.

German heavy antiaircraft guns, like our own, fire high explosive shells equipped with time fuzes. These explode after a chosen time interval for which the fuze can be set, and consequently at a definite range. The shell fragments are projected outward from the burst at high velocity, and this produces a certain "lethal area," larger or smaller according to the size of the shell.

The principal German heavy antiaircraft guns are as follows: (a) the 75-mm, corresponding to our 3-inch; the 88-mm, which somewhat corresponds to our 90-mm; the 105-mm, the 128-mm or 5 inch; and the 150-mm or 5.9 inch. About 65 per cent of the German heavies are 88-mm, and about 20 per cent are 105-mm. The 75's, 128's, and 150's are thus comparatively rare, and in planning high level air operations it is usually sufficient to make estimates on the basis of capabilities of the 88-mm and 105-mm guns.

In the same way that the self-destroying tracer reduces the theoretical maximum vertical range of light automatic weapon shells, so does the limitation of the time fuze used reduce the theoretical maximum vertical range of heavy antiaircraft shells. The maximum vertical range of the 88-mm, theoretically 35,700 feet, is thus reduced to a ceiling of 32,500 feet for maximum time setting of the fuze employed.

Corresponding figures for the 105-mm are 41,300 feet and 37,000 feet. The lethal radius of burst, for the 88-mm is considered to be about 30 feet, and the practical rate of fire 15 rounds per minute. For the 105-mm shell, lethal radius of burst is about 50 feet, and the practical rate of fire from 8 to 10 rounds per minute.

b. Capability of Heavy Antiaircraft

In order to get a picture of the general capability of a heavy antiaircraft gun, it is useful to consider the line traced by the shell bursts if we fire, with maximum fuze time setting, a series of shots aimed toward the same compass point but at successively greater angles of elevation above the horizontal. The first shell, fired at a low angle, will burst far out from the gun horizontally, but at low altitude. Each successive shell, fired at a higher angle, will burst less far out horizontally and at a greater altitude. It is evident that if we join the successive shell bursts by a continuous line, we get a rounding curve extending upward from the maximum horizontal (fuze) range to the maximum vertical (fuze) range.

If we picture this series of shots as being repeated with different compass-point aimings of the gun, it is evident that we get a series of exactly similar curves, which all together define for us a sort of rounded, umbrella-like envelope

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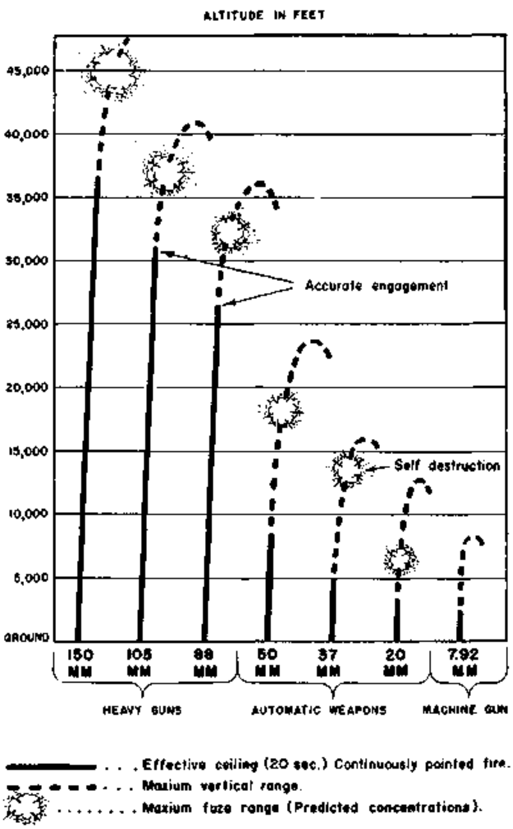
in space, over the gun.

This imaginary "umbrella" is the "limiting envelope" for the particular gun. It is evident that an airplane flying anywhere under this umbrella is within range of the gun, and that an airplane outside it is not within range.

If we imagine this "limiting envelope" to be cut by horizontal slices at various altitudes -- 5,000 feet, 10,000 feet, etc. -- we obtain a series of circles, one for each height. These are the "effective gun circles," each applying to its particular altitude. An airplane flying at any particular altitude comes within gun range when it touches on or is inside the "effective gun circle" for that altitude.

CEILINGS FOR GERMAN AA GUNS



NOTE: For heavy guns, the effective ceiling for continuously pointed fire (20 second minimum period) is considerably below the maximum fuze range; and that for automatic weapons, the range for accurate engagement is considerably short of the point of tracer self-destruction. Guns of all types become rapidly less effective with near approach to their extreme ranges. (See <u>Tactical and Technical Trends</u> No. 25, p. 5.)

c. <u>Fire Control Methods</u>

The Germans use three main methods of fire control, namely: (a) continuously pointed fire, with director control; (b) predicted concentrations by plotting; and (c) barrage fire.

In continuously pointed fire, operators for each battery independently follow the target through telescopes. Its altitude is inserted from a range finder, and the necessary calculations are made mechanically by the director, for aiming the gun at a point in space where the shell and the airplane will arrive simultaneously--provided the airplane does not change course, altitude, or speed on which the director bases its prediction. Appropriate evasive action therefore consists of changes in course and height, at intervals determined by the necessary time for prediction of aim and flight of the shell. Due to the longer time of flight of shells, and the shorter period during which the gun can engage, the effectiveness of this type of fire decreases rather rapidly at the higher altitudes. The effective ceiling for this type of fire is less by about 6,000 feet than the maximum fuze range of the shell, as indicated by the diagram.

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Predicted concentrations can be fired to the full height allowed by maximum fuze time setting. For this type of fire, a plot of the aircraft's course is made in a central control room; and as soon as its intended course on its bombing approach can be predicted, necessary data are calculated for a future point of its arrival in the sky. Each gun battery, utilizing the basic data, makes its own computation for this predicted point, and each battery fires a salvo so timed that salvos of all the batteries burst simultaneously at the predicted point. Sometimes second and third salvos are fired immediately on the same data.

This method requires that the aircraft be flying reasonably straight and level for about 90 seconds before reaching the predicted point. Evasive action is indicated up to the actual beginning of the bombing approach, which should be as short as consistent with accuracy of bombing. Subsequent concentrations against bomber formations passing through the same predicted point may be fired in a much shorter time since the initial plotting already has been done.

Barrage fire, as the name indicates, depends on the placing of a barrier across the probable course of the aircraft. A geographical or fixed barrage is fired by all guns within range into a certain sky volume or box, usually just outside the expected bomb release line of the aircraft. If the barrage is properly placed, the aircraft must fly through the bursts in order to bomb the objective. It is obvious that the gunners should be kept uncertain, up to the last possible moment, as to the intended objective and the direction of the bombing approach.

In a short article of this nature, only highlights can be touched upon. Detached studies of antiaircraft gunnery have been made, which go thoroughly into the effectiveness of each category of weapons over the appropriate zone of fire. Their findings are of great practical value to all who fly on combat missions. The recommendations made with respect to evasive action and protective measures during flight over enemy territory derive from the combined experience and best thought of competent authorities. Careful attention to such studies, and thorough understanding of their precepts, will pay dividends in added safety.

ANTITANK

3. COASTAL ANTITANK OBSTACLES

The following information concerns types of construction of concrete walls and other antitank obstacles in Holland, Belgium and France. Further details on this subject are contained in the publication, German Coastal Defences, issued as Special Series No. 15, 15 June 1943 by the Military Intelligence Division, War Department.

Walls are used to block streets and roads in coastal towns, as obstructions on approaches to key points, and on the outskirts of towns generally. Road blocks of this type, erected in line with the front elevation of existing buildings, will often form a continuous obstacle along the entire sea front of the town.

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Details of the steel reinforcement of such walls have not been learned but it is suspected that it is very light and in some cases does not exist at all. Hooked bars often project from the top of the wall and may be used to support wire. To increase the effectiveness of walls as obstacles, ditches are often excavated or pits are dug and covered with planks, road metal or netting.

In areas where large quantities of stone are readily available from quarries, road blocks are often constructed of stone and not concrete.

V-shaped walls may be found across beach exits, especially on open beaches outside of towns. Gun emplacements or small pill boxes may be found at the point of the V, which is to the front - towards the sea.

Concrete walls have a minimum thickness of 6 feet but probably average 8 to 11 feet in thickness. Height varies from 6 feet to 8 feet, 6 inches.

When walls are gapped, the gap is usually sufficient for one vehicle to pass at a time. In one type the walls are built opposite one another from each side of the road, the gap being closed at will by girders, rails or gates which fit into sockets precast in the wall ends.

Another obstacle that may be encountered in the coastal districts of north-west Europe is a staggered type of double road block consisting essentially of a pair of walls or barricades built one behind the other and projecting from opposite sides of the road for a distance of one-half to two-thirds of the width of the road.

These double road blocks may be constructed of masonry or concrete, or they may be earth-filled timber barricades. Horizontal and vertical members of timber barricades are described as 10-12-inch diameter pine logs, the vertical members driven deep into the ground. The walls are strengthened by diagonal bracing. Apart from the presence of a passage through them, these barricades would form an effective obstacle against a frontal assault by medium tanks, though a heavy tank may cross and probably demolish them. Where these barricades are constructed in concrete it is fairly certain that they are not less than 6 feet thick. The average height has not been reported.

Concrete obstacles known as "Dragon's Teeth" are also used to block streets, exits from quays, and well defined beach exits, particularly where the level of the beach approximates the level of any road or track. This type of obstacle often consists of three or four staggered rows, 6 to 8 feet apart, the distance between the teeth in each row being 6 to 8 feet. The "Dragon's Teeth" probably average 2 feet, 6 inches to 3 feet in height. It is possible that the teeth are connected at their bases, from front to rear, by concrete beams to prevent overturning. No information is available of any steel reinforcements in the teeth.

Concrete cubes are used in the same way as "Dragon's Teeth" and are also found across hollows in dunes which might provide exits for vehicles. Cubes are used in rows, not always staggered. In dune country they are generally on a forward slope, near a crest. Where the pillars are rectangular, they measure

about 3 feet on each side by 4 feet in height. Other obstacles of this type are about 4 by 4 feet in dimensions.

In addition to concrete and stone, steel is often used in the construction of beach and road obstacles.

Steel tetrahedra, pyramid-like, are made of steel rails or L-sections. They consist of 3 or 4 lengths of steel in the form of a cone, with the ends embedded in concrete and bolted at the top. When obstacles are made of L-sections, the upper ends appear to be specially cut and are welded together at the apex. There are two types, one which is 3 feet, 3 inches high with the ends bolted or welded, and the other type 4 feet, 6 inches high, bolted 3 feet, 3 inches above ground level with the ends projecting above the join.

Steel rails are occasionally placed vertically in 2 or 3 rows to form blocks across streets or well defined exits on open beaches. The rails project about 4 feet above ground level and are embedded in concrete.

4. RUSSIAN ANTITANK TACTICS

While the tank, which has received its greatest exploitation in the present war, has under certain circumstances proved to be a formidable weapon, important successes have been scored against it by artillery and tank-destroyer guns in North Africa.

The tank has, no doubt, accelerated the speed of battle, helped to overcome space, expanded the area of the battlefield, and increased the tempo of attack.

The experience of the Russians on the Eastern Front in combatting large concentrations of German armor can be read with interest and profit. The following article, a translation of Russian reports, deals principally with Russian defensive measures against large-scale German tank attacks in the Orel-Kursk sector.

* * *

a. <u>Organization of the Defense</u>

When beginning large offensive operations, the Germans lay the main stress on tanks. They concentrate them on narrow sectors in order to effect a break-through and then push through their motorized units and infantry. The problem of the air force and artillery is one of direct support of the tanks on the battlefield. Therefore, defense must be organized so as to repulse the combined blows of the enemy, and especially his tanks. Experience has shown that the best results are gained by the establishment of antitank defense areas.

[redacted]

From reconnaissance data the Russian commander determines the sectors of primary and secondary importance in connection with possible tank attacks. Where the terrain is the more accessible (level or broken, but without deep ravines and swamps) there must be more antitank defense areas. During reconnaissance, the commander determines the most expedient way of using antitank guns and rifles; the location of the sector where they are to be used and the character and type of the most advantageous obstacles under the given conditions. It must be taken into consideration that not all seemingly impassable sectors are actually so. Therefore, it is advisable to organize a system that keeps the approaches to "impassable" tank areas within fire range.

In one case fifteen German tanks attacked the Russian advanced positions. The left flank bordered on a ravine difficult for tanks to pass. The Russian artillerymen easily repulsed three frontal attacks, but the Germans then blew up the steep sides of the ravine and made it passable for tanks. Since the approaches to the ravine were not covered by artillery fire, the enemy tanks broke through and attacked the Russian battery from the rear. It was possible to restore the position only by bringing in the antitank reserve.

The officer directly in command of the antitank defense areas must calculate the amount of fire power and dispositions. The amount of fire power depends upon the density of the tank attack on the given sector. If it happens that there are not enough antitank defenses, the commander requests more from the higher authority. If, however, the commander has only a limited number of antitank guns and rifles, he must not scatter them throughout the defensive positions but must use them on the main sectors.

Certain commanders, in determining the amount of antitank defense calculate on the basis of the theoretical possible density of a tank attack. In reality, however, the Germans have a very limited number of tanks on many sectors. Therefore, the expected and not the theoretical density of a tank attack must be considered. In case of enemy reinforcements, the antitank defense areas may have to be strengthened.

It is of great importance to have all approaches and intervals between defense areas within range of converging defense fire. In addition, the fire power is disposed so that any tanks, that may have broken into the defense area, may be hit.

b. Disposition of Antitank Guns and Rifles

Combat experience has shown the effectiveness of the following disposition of antitank guns and rifles. Guns are placed at intervals of from 100 to 150 yards and with distances in depth of from 200 to 300 yards. Antitank rifles are arranged in squads. They deliver flank and oblique fire simultaneously with the guns. The intervals between squads of armor-piercing weapons are from 50 to 100 yards and the distances from 100 to 150 yards. With flanking fire, the distance between the guns and rifles must not be over 100 to 150 yards.

c. Cooperation between Defense Areas

Constant communication is maintained between defense areas. There should be complete and detailed agreement as to the methods of cooperation. The distance between the guns on the flanks of the two defense areas should not be over 500 yards. For antitank rifles this distance is reduced to from 150 to 200 yards.

d. Cooperation between Artillery and Infantry Commanders

The artillery commander establishes close contact with the infantry commander of the unit in the region in which the antitank defense is formed. Practice has shown the advantage of sending to the combat outpost a special liaison officer, who, in case of a tank attack, determines the number and direction of action and immediately reports to the defense area.

e. Artillery Tactics Against Tank Attacks

For repulsing large tank attacks, artillery of all calibers and heavy mortars are brought into use. Batteries that fire from concealed positions adjust their fire toward the approaches and antitank obstacles. In case of a tank breakthrough there must be a very detailed agreement with the artillery commanders concerning signals. When conditions dictate, divisional and, at times, heavy artillery may be put out into open fire positions; these should be prepared in advance.

The antitank defense system as a whole is thoroughly camouflaged. Strict discipline in firing must also be observed. It is not necessary to fire from all guns at individual tanks or when they appear in small groups of three to four; it is more advisable to allow them to come within range of direct fire. When the enemy makes mass tank attacks the artillery opens fire at the greatest effective range. In addition, mobile artillery of all calibers and firing from concealed positions is used.

f. Antitank Reserves

Since the antitank defense cannot be equally strong throughout its whole system, antitank reserves are of special importance. The reserves are allocated to threatened sectors by army commanders. It is expedient to prepare in advance firing positions for the reserves on sectors that are more likely to be pierced.

It is well for the next higher headquarters to prepare a plan of maneuver for the antitank reserve. In this plan the composition, commander, line of possible deployment and detailed routes are indicated. It is also well to have a signal (known both to the army commander and the commander of the reserve group) for calling the reserve.

g. An Example of Defense Tactics

German tank attacks in the Orel-Kursk sector were characterized by large

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concentrated blows of several hundred tanks at a time on narrow sectors of the front. Following the first echelons were the second and third, with the number of tanks increasing each time. There were several instances when the Germans brought over 200 tanks into battle at one time. The air force cleared the way for the tanks, and the tanks in turn cleared the way for the infantry. During the very first days the enemy suffered defeat in the battle for air supremacy. This left the tanks to break through the defense without air support while facing our artillery.

Preceding a concentrated tank attack the enemy conducted combat reconnaissance with small groups of infantry and tanks. This reconnaissance usually began 30 or 40 minutes before the attack. Enemy reconnaissance columns consisted of from 50 to 60 tanks and several self-propelled artillery guns on which infantry men were carried. These detachments were usually supported by 10 to 15 airplanes. As a rule the combat reconnaissance lasted not more than half an hour. In repulsing these groups the minimum of fire power was used in order to keep the main artillery positions concealed.

During the first battles the German tanks at times succeeded in piercing our front line as much as a mile. In one case seven German bombers appeared, escorted by fighters. While these planes began to bomb the front line, another group of bombers coming in to take the place of the first group raided deeper in the rear. Each group was followed by another as they worked their way deeper and deeper into our defense positions. Tanks appeared simultaneously with the third group of bombers. Forty of them deploying along the front and in depth, rushed out at our front line, firing as they came. Several were disabled but a part of them passed the trenches of our first line. Our infantry remained in its positions and exterminated automatic riflemen who were carried on the tanks, blew up two self-propelled guns and burned up one tank as it was crossing the trench.

At this moment Soviet fighters appeared over the battlefield. Several enemy bombers were shot down. The artillerymen made use of this and opened up intensive fire on the tanks but 20 enemy tanks succeeded in penetrating to the depth of half a mile, where they were met by self-propelled cannons. By this time a great air battle was under way and 150 more German tanks came out against our positions.

The lessons learned in the Orel-Kursk sector were that in fighting reconnaissance and first echelon groups it is necessary to: (1) not only repulse tanks but destroy them; (2) do this as quickly as possible since hundreds of tanks follow; (3) solve this problem with the minimum amount of fire in order to keep the disposition of all guns concealed.

The main object of our infantry is to isolate the German infantry from their tanks, annihilate them, and protect our artillerymen from attacks. Our infantry has always remained intact when they do not leave the trenches as enemy tanks cross them. By remaining in the trenches they are able to separate enemy infantry from the tanks and also destroy infantry when it is tank borne.

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Battle experience shows that we must strike tanks with concentrated artillery fire and from the air on their initial positions and at the approaches to the battlefield. During the attack it is necessary to allow the tanks to approach to be sure of hitting them. The Orel-Kursk battles show that even tank break-throughs are not dangerous if the enemy infantry has been separated from the tanks.

5. USE OF HAWKINS GRENADES

Tests conducted by the 50th Division engineers have shown that it is necessary to use two of the British No. 75 Hawkins grenades, one on top of the other with one right side up, to sever the track of the Mark III German tank.

During the tests, many of these grenades failed to explode when safety fuze detonators were used.

ARMORED

6. GERMAN COMMENT ON ENEMY TANKS

A critical study of French, British, Russian and American tanks was published on 27 June 1943 in the German weekly newspaper Das Reich. It is interesting to note that the author does not attempt to minimize the merits of American tanks, particularly the General Sherman, and that he concedes that Germa soldiers "know the dangers represented by these tanks when they appear in large numbers." A translation of the Das Reich article follows:

* * *

The German High Command maintains a museum of captured tanks -- or one might say a kind of technical school where some of our most highly skilled engineers and a number of officers specially chosen for the purpose are testing those monsters of the enemy's battle cavalry, testing their adaptability to the terrain, their power of resistance to attack, and their special qualities suiting them for employment in attack. These tests are carried out in a forest region of central Germany where the terrain up-hill and down-hill is intersected by ravines and all manner of depressions of the ground. The results are embodied in long tabulations not unlike those prepared by scientific laboratories, and in recommendat to the designers of German counter-weapons, who pass them on to the tank factories and armament shops. The type of combat actually carried on at the front is reenacted here in make-believe encounters worked out to the last point of refinemen

The officer in charge of these experiments has developed a thesis which is extremely interesting, even though higher headquarters are not, without exception,

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in agreement with him. He contends that the various types of tanks reflect psychological traits of the nations that produced them.

The French have produced a number of unmaneuverable but thickly armored "chars" embodying the French doctrine of defense. They are conceived as solid blocks of iron to assist the troops in rendering the solidified defensive front even more rigid. The Renault and Hotchkiss types of tanks have indirectly contributed toward stagnation of the military situation. It was out of the question for these French tanks to swarm forth in conquest into the plains of enemy territory, dashing madly ahead for distances of hundreds of kilometers. Their crews normally consisted of only two men each. It was impossible for these tanks to cooperate as members of a complex formation. Communication from one tank to another was limited to the primitive method of looking through peepholes in these cells of steel.

The French still have, from the period shortly after the first World War, a 72-ton dreadnaught, the weight of which is distributed over the length of three to four railroad undertrucks; it carries a crew of thirteen; but its armor is of a type that simply falls apart like so much tin under fire from a modern cannon. As late as 1940 there were those in France who demanded increasing numbers of these rolling dry-land ships and wanted them to be of stronger construction than ever before. But German troops encountered these 72-ton tanks only in the form of immobile freight shipments not yet unloaded in the combat zones.

In the opinion of experts, English tanks of the cruiser class come much nearer to satisfying requirements of a proper tank for practical use in the present war. The name in itself indicates that the basic idea was carried over from naval construction. These tanks are equipped with a good motor and are capable of navigating through large areas. The amount of armor was reduced for the sake of higher speed and greater cruising radius. Tactically these tanks are more or less a counterpart of torpedo destroyer formations, out on the endless spaces of ocean. They are best adapted -- and this is quite a significant factor -- to the hot and sparsely settled areas of the English colonial empire. The English tank is an Africa tank. It has a narrow tread chain. It did not come much into the foreground on the European continent. A tank for use in Europe, apparently, is something for which the English don't show so much talent.

On Soviet territory the English tank was a failure; and it shares this fate with the North American tanks, which were not appreciated very much by the Soviet ally. These North American tanks include, for instance, the "General Stuart," a reconnaissance and rear-guard tank, bristling with machine-guns, as well as the "General Lee." Although the latter possesses commendable motor qualities, its contours are not well balanced, and its silhouette is bizarre and too tall.

This criticism does not apply, however, to the most recent North American development, the "General Sherman." The latter represents one of the special accomplishments of the North American laboratories. With its turtle-shaped crown rising in one piece above the "tub" and turret it must be regarded as quite

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a praiseworthy product of the North American steel industry. The first things to attract attention are serial construction and fulfillment of the almost arrogant requirements of the North American automobile industry as regards speed, smooth riding, and streamlined contour of the ensemble. It is equipped with soft rubber boots, that is with rubber padding on the individual treads of the caterpillar mechanism. It seems largely intended for a civilized landscape or, to put the matter in terms of strategy, for thoroughly cultivated areas in Tunisian Africa and for the invasion of Europe. It represents the climax of the enemy's accomplishments in this line of production. But we cannot gain quite the proper perspective until we examine also the tank production of the Soviets.

The T-34 used by the Russians at the opening of hostilities in 1941 was at that time the best tank produced anywhere -- with its 76-mm long-barrelled gun; its tightfitting tortoise-shaped cap, the slanting sides of its "tub," the broad cat's-paw tread of its forged caterpillar chains capable of carrying this 26-ton tank across swamps and morasses no less than through the grinding sands of the steppes. In this matter the Soviet Union does not appear in the role of the exploited proletarian but rather as an exploiter of all the varied branches of capitalistic industry and invention. Some of the apparatus was so closely copied after German inventions that the German Bosch Company was able to build its own spare parts unmodified into the Soviet-constructed apparatus.

The Soviet Union was the only nation in the world to possess, even prior to the approach of the present war, completely perfected and tried-out series of tanks. The Soviets had such tanks, for instance, in the autumn of 1932. Basing their procedure on experience gained in maneuvers, the Russians then developed independently additional new series, building to some extent on advances abroad, like those embodied in the fast Christie tank (speed 90 to 110 km.) of the North Americans.

Like Germany and England, the Soviet Union thereupon hit upon a tank constructed for employment in separate operational units. Groups of these tanks operate in isolation in advanced zones of combat, at increasing distances from the infantry. Only a minor tank force is thrown into action for tactical cooperation with infantry forces. Such, at least, was the idea. And in fact, the T-34 was found suited for this type of action -- though in many instances only by way of covering a retreat. But even for this type of tank, positional warfare has in many instances had the result of narrowing the designer's and the strategist's operational conception to the narrower range of tactical employment.

The Soviet Union also has constructed an imitation -- in fact two imitations -- of an amphibian tank built by Vickers-Armstrong. Another variant of Soviet thought on the subject came to the fore when the Russians constructed a 52-ton land battleship with 3 turrets, a vehicle of quite impressive appearance but provided with walls that were not stout enough to serve the purpose. The first of these monsters broke down in the mud a short distance behind Lemberg, in 1941. After that they were found more and more rarely; and at last they dropped out altogether.

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In order properly to evaluate the most recent tank creations, such as the North American "General Sherman" or the German "Tiger", one must learn to view a tank as embodying a combination of firing power, speed, and resistance or, to express the same idea more concretely, as a combination of cannon, motor, and armor. In this type of construction, the paradoxes involved in the ordinary problems of automobile body building are raised to their highest potential. A mere addition to one of the above-indicated dimensions, let us say the motor by itself or the armor by itself, is not apt to be of value.

A fast-moving tank must not weigh much, and heavy armor does not ride well. The caliber of the cannon affects the size and weight of its ammunition; and a difference in the latter is usually multiplied about a hundredfold, since tanks usually carry about 100 rounds as reserve ammunition. Taking all these things into consideration, we look upon the "General Sherman" as embodying a type of strategy that is conceived in terms of movement: it is a "running" tank, all the more since the Americans most likely expected to use it on readily passable terrain, that is on European soil. The caliber of its principal weapon is slightly in excess of the maximum so far attained by the foreign countries. It is spacious inside. Its aeroplane motor is of light weight. It is a series product, the same as its cast-steel coat, the latter being modeled into an almost artistic-looking contour, in such manner as to offer invariably a curved, that is a deflecting surface to an approaching bullet.

In Tunis, German soldiers have demonstrated their ability to deal with this tank; but they know the danger represented by these tanks when they appear in large herds. An imposing innovation is the stabilization equipment of the cannon. This equipment is connected with a system of gyros and permits even and smooth laying of the gun. This system was taken over from naval artillery and applied to the shocks incident to swaying over uneven terrain, where stabilization, of course, represents a far more difficult problem. This is the first attempt of its kind ever to be made anywhere.

7. THE GERMAN GUN "FERDINAND"

Characteristics of the "Ferdinand," a German self-propelled gun which first appeared in July, on the Russian front, are:

a. General

Weight	70-72 tons
Length	22 feet, 11 3/4 in
Height	9 feet, 10 in
Width	11 feet, 5 3/4 in
Track width	2 feet, 5 1/2 in
Clearance	1 foot, 7 1/2 in

b. Armor

(1) Hull

Front	7.87 in
Sides (vertical)	6.29 in
Rear	4.33 in
Belly	1.57 in

(2) Fighting Compartment

Front (vertical)	7.87 in
Sides (sloping)	3.74 in
Rear (sloping)	3.34 in
Roof	1.57 in
Mantlet plate	4.33 in

c. Armament

(1) One 88-mm super-long gun fitted with muzzle brake.
(2) One MG 42.

d. Ammunition carried

70-90 rounds for gun, 2,000 rounds for MG.

e. Suspension

Six independently sprung bogies, diameter 2 feet, 7 1/2 inches; evenly spaced and not overlapping.

f. Performance

Maximum speed	12 1/2 mph
Cruising speed	6-9 mph
Maximum gradient	30^{o}

g. Drive

Two Mayback motors, HL-120 TRM 300 hp each.

h. Crew

Total, six: commanding officer of ordnance--lieutenant (tank or artillery), gunner, mechanic-driver, radio operator, two loaders.

The "Ferdinand" is guided by observation through periscopes (one each for the commanding officer, the driver, and the gunner). There are no observation slots. Radio transmitter and receiver are provided for external communication; there is a radio-microphone for internal communication. The motor is situated

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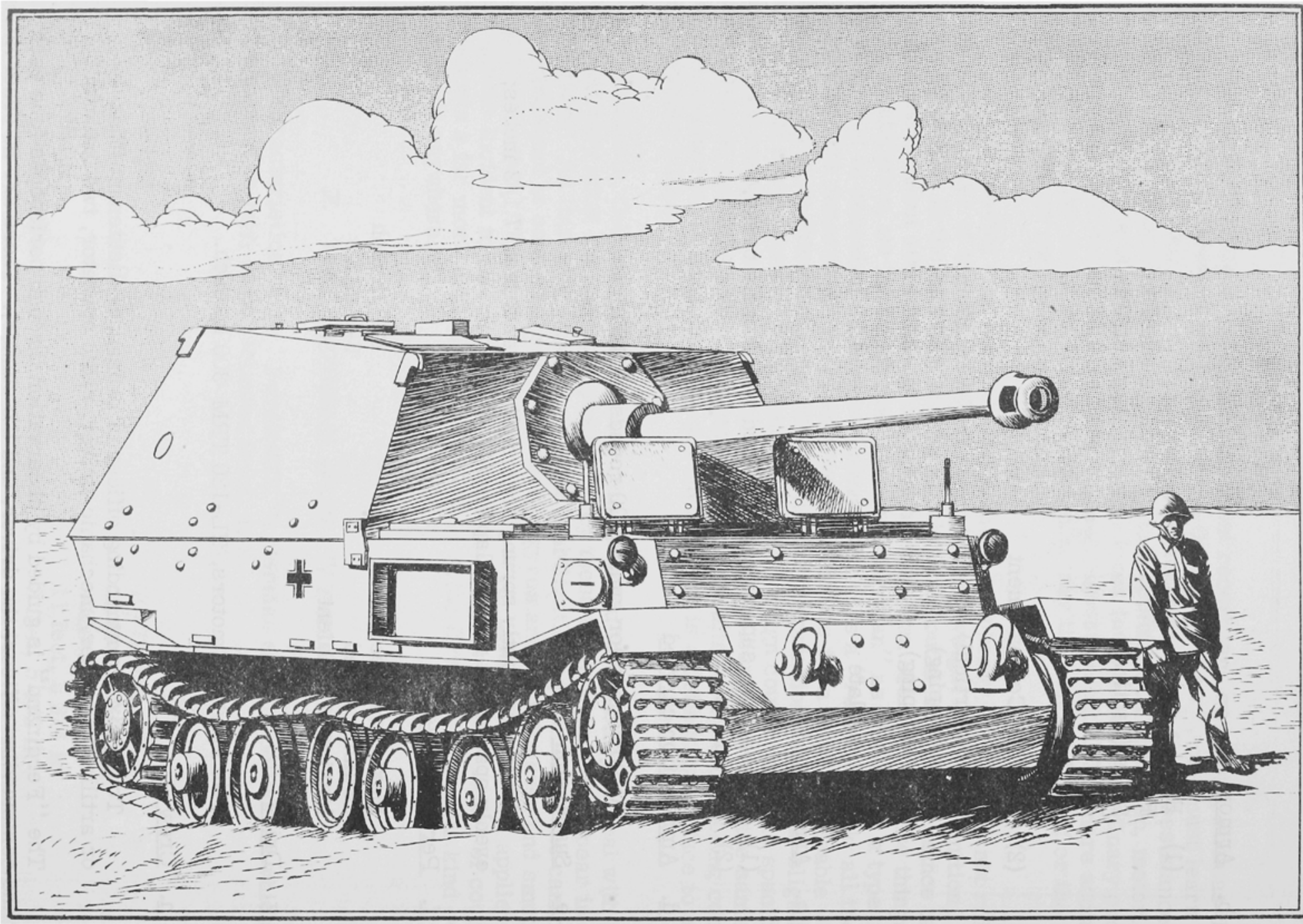

THE "FERDINAND" (FRONT AND SIDE VIEW)

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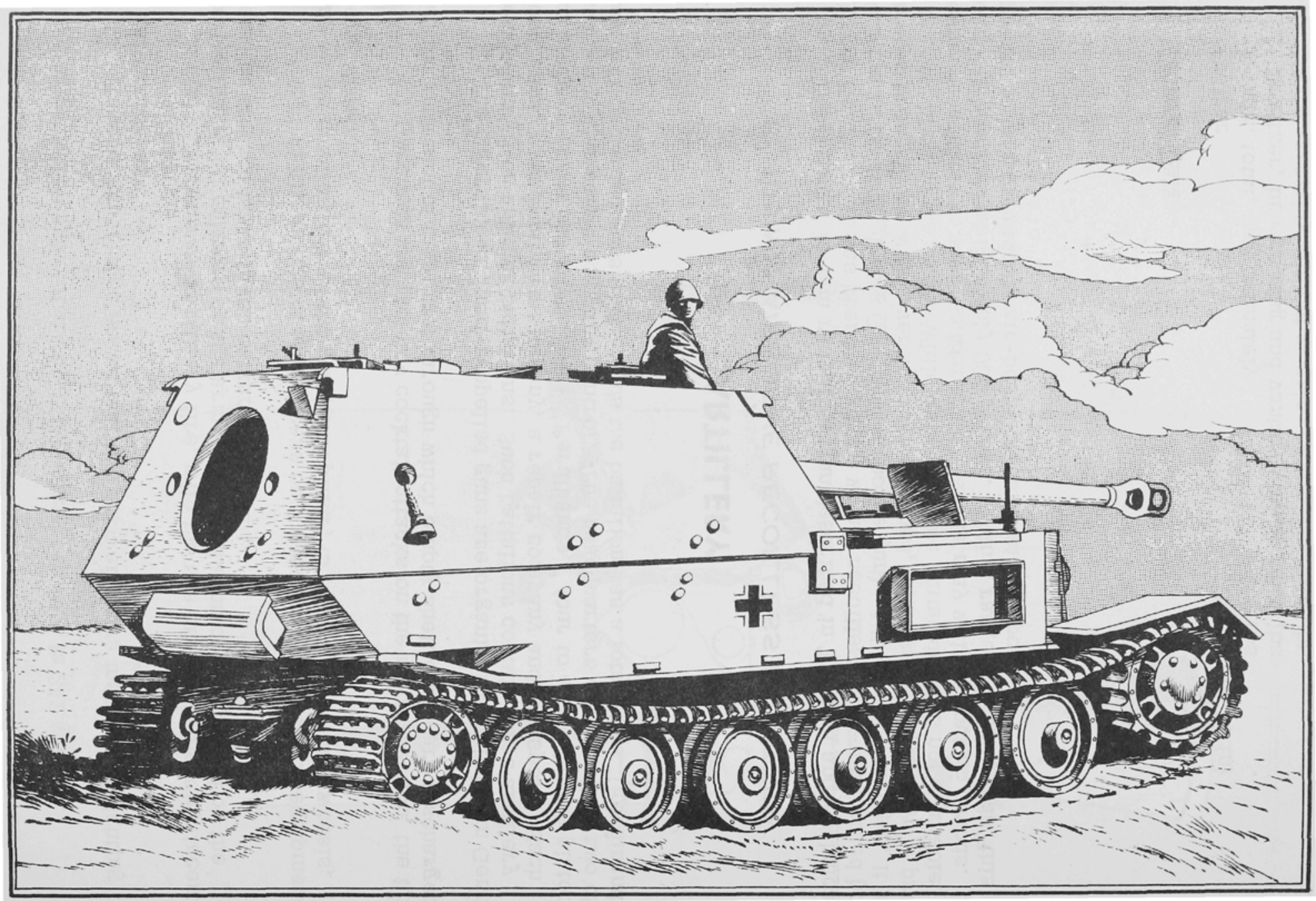

THE "FERDINAND" (SIDE AND REAR VIEW)

[redacted]

practically in the center of the hull. Gasoline capacity is 242 gallons.

Russian experience shows that the most effective methods of fighting the "Ferdinand" are:

(a) Concentrated artillery fire, with the use of armor-piercing incendiary projectiles of all calibers on the armored installation of the gun and on the gasoline storage tanks in the center of the hull.

(b) Artillery fire of all calibers on the cannon, observation equipment and on the mobile parts of the gun (caterpillar, driving and steering wheels, bogie wheels).

(c) Grenade and Molotov cocktail attacks on the motor section, the turret lid, the rear slot of the turret through which empty shell cases are discharged.

The "Ferdinand" self-propelled guns are organically included in German heavy demolition antitank battalions. Such battalions contain three artillery companies, a headquarters company, a repair company and transport. Each artillery company has a total of 14 "Ferdinands," four to each of three platoons and two to immediate company control. The headquarters company has two of these new self-propelled guns also. Thus the battalion has a total of 44 "Ferdinands."

ARTILLERY

8. 105-MM AIRBORNE RECOILLESS HOWITZER

The German 75-mm recoilless gun described in Tactical and Technical Trends No. 26, p. 15 has been reinforced with a recoilless, 105-mm, rifled howitzer, 10.5-cm L. G. 40 (Leichtes Geschutz airborne gun). Like the 75-mm gun, it has an open breechblock with a venturi tube attached, and "shoots both ways", producing a terrific blast to the rear. While data as to the ammunition is not available, it seems reasonable to suppose that the projectile may weigh about 25 pounds. The complete howitzer weighs only 900 pounds. With a range of 6,660 yards, this gun appears to be a formidable air-borne or mountain weapon.

* * *

General Data.

Caliber	105-mm (4.13 in)
Weight, total, approximately	900 lbs
Howitzer, breech ring and venturi tube	500 lbs
Axle assembly without wheels	160 lbs
Trail	86 lbs

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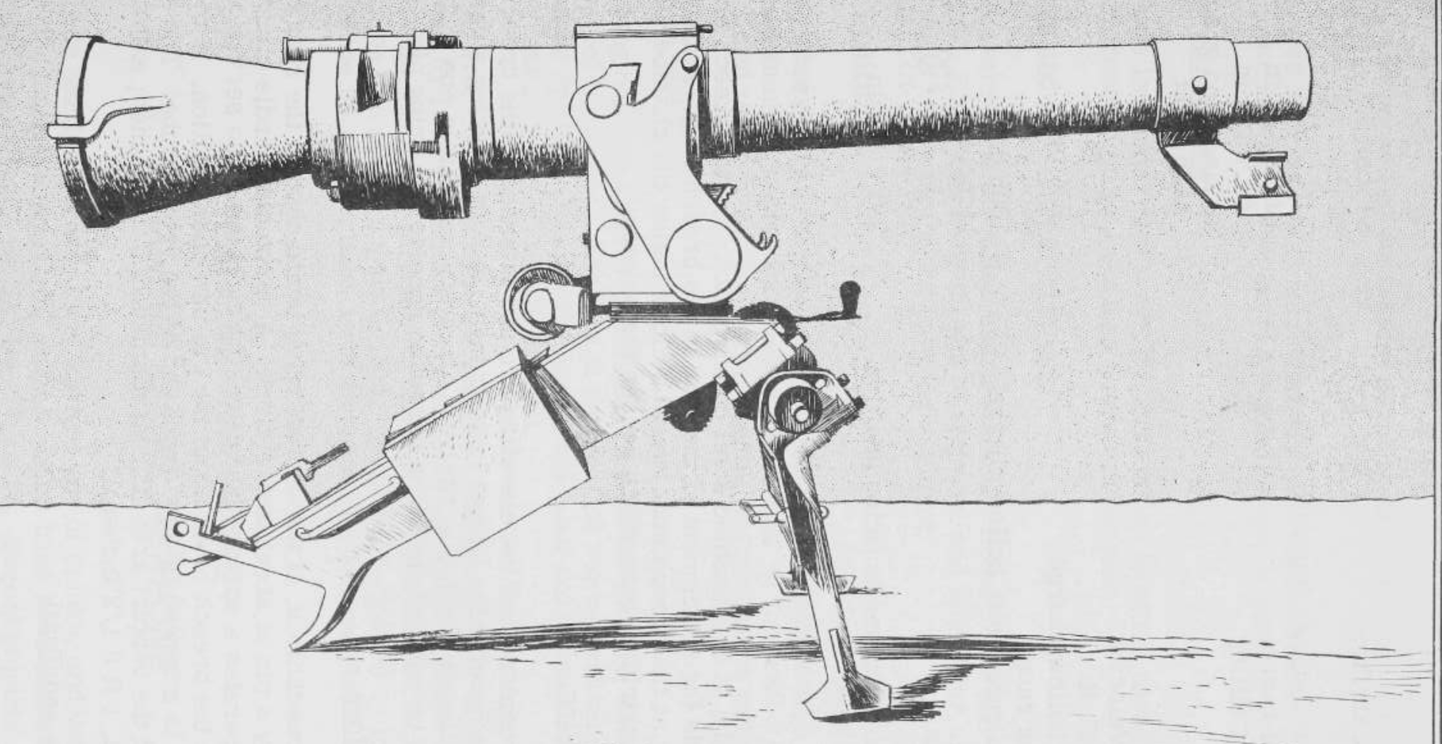


105-MM RECOILLESS HOWITZER

Upper carriage	58 lbs
Shield	86 lbs
Length of howitzer (overall)	6 ft 3 in
Length of barrel	4 ft 6 1/4 in
Length of rifling	2 ft 7 1/4 in
Rifling	32 lands and grooves, right-hand twist
Muzzle Velocity:	
Firing H. E.	1105 fs
Firing hollow charge	1224 fs
Maximum range	6660 yds
Effective range with hollow charge	1665 yds
Tube	Monobloc
Elevation	- 15° to + 40°
Traverse	40° right, 40° left
Height of trunnions in firing position (on tripod)	2 ft 8 1/2 in

Barrel.

The tube is of monobloc steel construction. On the breech end, interrupted collars provide for attachment of the tube in the breech ring. A keyway is cut longitudinally at the breech end, twelve o'clock inside the chamber, to receive a key on the cartridge-case which houses the primer.

Breech Ring.

The trunnions and the elevating arc are attached to the breech ring which is recessed to receive the barrel locking lugs. A hole, housing a percussion firing mechanism is located at twelve o'clock approximately one inch from rear face and lines up with a hole in the barrel to receive the firing pin.

Breechblock

The breechblock, of the venturi type, is attached to the rear face of the breech ring by a pin at about four o'clock. A horizontal handle situated at about ten o'clock operates a spring-loaded locking catch and also serves as a lifting grip to rotate the breech block about the pin into open position. A replaceable steel bushing is screwed into the front end of the venturi tube. The approximate dimensions of the venturi are: Throat diameter, 3 5/8 inches; exit diameter, 11 inches; length, 1 ft 8 1/2 inches.

Carriage and Trail

The lower carriage is formed by the trail which is of box-type, welded construction, and has a bushing at the front end to receive a perpendicular pin fixed to the axle. A lever fitted to the axle raises the wheels off the ground after a tubular steel bipod has been swung down to firing position. In travel this bipod

is swung back and hooked to the bottom of the trail. The legs of the bipod are detachable.

The upper carriage is constructed of welded sheet steel. The pintle is fixed to the bottom of the upper carriage and fits into a bushing in the trail.

Axle and Suspension

The axle is tubular steel, and the suspension is of the parallelogram type acting on compression helical springs housed in the axle.

Traverse and Elevation Mechanism

The traverse and elevation handwheels are fitted to the left side of the upper carriage. Elevation is by means of segment and spur gear and traverse is effected by means of worm and worm-gear segment.

Travel Position

The howitzer may be drawn by a vehicle. In towing position the piece is elevated to maximum elevation and locked to the rear of the trail by means of a spring-loaded catch fitted to the trail; the towing lunette is fixed to the bottom of the muzzle.

Parachute Loads

Carrying handles are fitted to both sides of the muzzle, both sides of the barrel in front of the breech ring and at the rear of the venturi tube. The barrel assembly can be split into two loads, barrel one load and breech ring and breechblock (venturi tube) as the other load.

The upper carriage becomes a load by lifting pintle out of trail. The trail, a separate load by lifting off from perpendicular pin fixed to the center of the axle, and the axle assembly is taken as one load. The wheels which are easily removed, can be taken as a separate load. The shield, hooked on to lugs fitted at the front of the upper carriage, is likewise easily removable.

CHEMICAL WARFARE

9. JAPANESE SMOKE WEAPONS

Japanese partiality toward the tactical use of smoke, and various materiels employed by the Japanese army's* "smoke" units have been discussed in Tactical and Technical Trends No. 21, p. 11; No. 27, p. 12. Recent reports on this

*To allay suspicion, all chemical units in the Japanese army are referred to as "smoke" units.

[redacted]

materiel provides additional information in the form of descriptions of the Japanese frangible smoke grenade and the Japanese Type "99" self-projecting smoke candle.

The Japanese frangible smoke grenade is an iron-capped, spherical glass flask with a short neck and flat bottom. Measurements of the flask are:

Overall height	85 mm
Diameter (o.d.)	65 mm
Circumference	237 mm
Weight (empty)	161.2 grams
Thickness of wall	2 mm
Volume (to base of neck)	150 ml
Opening	16 mm

The closure consists of a red rubber stopper held under a red rubber washer within an inner iron crown cap, this being enclosed by a heavier iron outer crown cap.

Filling: The liquid filling of the grenade has the following properties:

Height of filling	31 mm
Volume	69.6 ml
Weight	118.0 grams
Specific gravity (calculated)	1.69

Composition:

Titanium tetrachloride	51.5%
Silicon tetrachloride	46.7%
Titanium and silicon oxides, by difference	1.8%

Functional Characteristics

The grenade is so shaped as to be easily thrown by hand. Titanium and silicon tetrachlorides are readily hydrolyzed by the moisture of the air, with the formation of the respective hydroxides and hydrochloric acid. The smoke produced is formed from the fumes of hydrochloric acid and the particles of hydrated titanium and silicon oxides.

Tactical Use

The smoke grenade is intended for screening operations. Though both titanium and silicon tetrachlorides are irritating to the skin as liquids, in ordinary field concentrations the smoke is hardly irritating enough to the respiratory system to cause coughing. Because of its size, the grenade used singly is ineffective for a continuous screen, but is intended for use at short-range such as screening the gun port of a pill-box or tank.

[redacted]

Comparison with Comparable U.S. Equipment

Titanium tetrachloride-silicon tetrachloride mixtures are not used by the U.S. Titanium tetrachloride alone, designated FM, is classed as limited standard for filling CWS smoke munitions but is not used as filling for frangible grenades.

The Japanese Type "99" self-projecting smoke candle has an outer cylinder, 8 inches in length, olive drab in color. The weight of the candle is 1283 grams (2.82 pounds) including a filling weighing 643 grams (1.41 pounds)

The starter mixture in a candle which has been examined was:

Potassium Nitrate	53.9%
Sulfur	19.6%
Aluminum powder	16.0%
Antimony Sulfide	10.5%

The smoke mixture in the candle examined analysed as follows:

Hexachlorethane	46.5%
Zinc (metallic)	20.4%
Zinc Chloride	18.3%
Zinc Oxide	14.8%

Evidently this self-projecting candle can be used for setting up an advance smoke screen in much the same manner as is accomplished by mortar or artillery shells, except that the range is shorter. There is a delay train in front of the starter mixture. This delays ignition of the candle for a definite time after it has been propelled from the outer case. The delay time has not been determined.

There is no U.S. munition comparable to the Japanese Type "99" self-projecting smoke candle. In tactical use it can be compared to the M-8 H C smoke grenade for very short range and to the small HC filled rockets, mortar shells and the 75-mm base ejection shell.

ENGINEERS

10. IMPROVISED ANTIPERSONNEL MINE

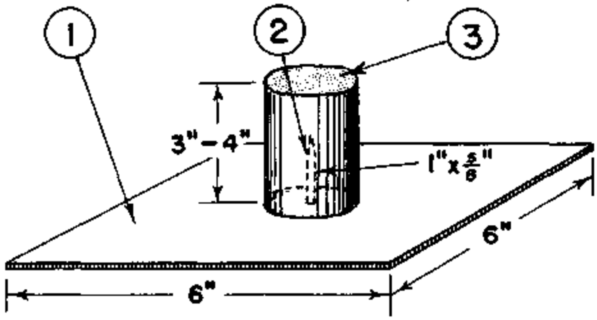
From sources believed to be reliable information has been received concerning an Italian improvised antipersonnel (grenade) mine which is said to have been constructed in large numbers at Tobruk.

The mine is reported to be fashioned from British gasoline tins, flattened through a hand roller. The design of the mine is shown in accompanying sketch.

[redacted]

The base (1) is a sheet, 6 inches square, in the center of which is a circular impression, slightly larger than the diameter of a hand grenade. A hole is punched in the base at the center of the circle and into this hole is soldered a piece of iron (2) which is 1 1/8 inches long and 5/8 inch wide. This piece of iron serves as a striker.

A strip of tin 4 to 5 inches high is curved to form a cylinder, or cup (3). This is soldered on to the outside edge of the circular impression in the base.



ITALIAN
IMPROVISED ANTIPERSONNEL MINE

The striker, detonator and fuze are removed from an ordinary hand grenade and a special instantaneous fuze inserted in their place. The grenade is then placed in the "cup" in such a way that the piece of iron (2) becomes the striker of the grenade.

The complete assembly is placed in the ground with the base uppermost. The weight of a person on the base is said to be sufficient to explode the grenade.

11. JAPANESE AT MINE, MODEL 93

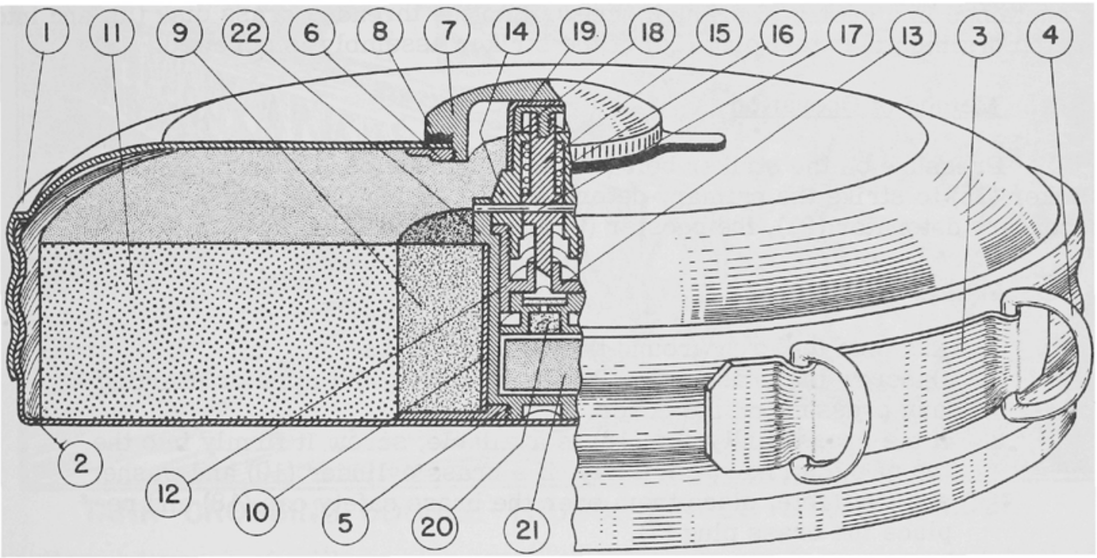
The Model 93 mine is dull brown in color, with a red band, 3/8 inch wide, around the central plug. The mine is 6 3/4 inches in diameter, approximately 1 3/4 inches in height; it weighs 3 pounds and the weight of filling is approximately 2 pounds. It bursts at about 260 pounds, but with a lighter shear-wire, will detonate at 70. Details of construction follow, illustrated in the accompanying sketch.

a. Container

The slightly domed upper half of the container (1) is secured to the lower half (2) by four corrugations. Two brass strips (3) are soldered to the upper portion of the container on opposite sides. Each strip has two brass D-rings (4), which are used for anchoring or carrying the mine. An internally-threaded brass disk (5),

[redacted]

9/16 inch in diameter, to which the detonator assembly is screwed, is soldered to the center of the bottom of the mine. A hole in the center of the upper portion is reinforced with a brass collar (6), threaded to receive a milled brass plug (7), which is fitted with a thin leather washer (8) to give a tight fit. The overlap of the two portions of the container is sealed by bituminous paint; the interior of the container is painted with black enamel.



JAPANESE ANTITANK MINE MODEL 93

b. Filling

The filling is in two portions. A booster (9) surrounding the detonator cavity, consists of an annular pellet of pressed picric acid, wrapped in paper and weighing approximately 0.1 pound. The central perforation is 5/8 inch in diameter and is lined with a cardboard tube (10). The main filling (11) consists of a slab of cast picric acid with a central perforation for the igniter assembly and booster. This slab is completely covered with a layer of paper cemented to the explosive by shellac and waxed externally.

c. Igniter Assembly

This comprises a brass cylinder (12) which is provided with a centrally-perforated transverse piece (13) to act as a striker guide. A plated steel plug (14) screws into the top of this cylinder and is drilled to take the plated steel striker (15) and spring (16). A shear wire (17) passes through a hole, 3/32 inch in diameter in the striker and steel plug. The upper end of the striker is drilled and threaded to take a brass safety cap (18) which, when screwed home, takes the pressure of the spring-loaded striker off the shear wire. A brass cylinder (19) with attached washer fits over this safety cap, forming an additional safety device

d. Detonator Assembly

This is in two parts. The primary detonator (20) consists of 0.06 gm. of mercury fulminate, potassium chlorate and antimony sulphide, pressed into a centrally-perforated copper cup and covered with a tinfoil disk. In the lower end of this detonator is a perforated gunpowder pellet. The secondary detonator (21) probably consists of a lead azide pellet surmounting a main filling of tetryl. It is contained in a casing (22) which screws into the threaded brass disk (5), and into the top of which the steel plug (14) of the striker assembly is screwed.

e. Method of Operation

Pressure on the striker bolt (15) shears the wire (17) and causes the striker (15) to strike the primary detonator (20), which fires in succession the secondary detonator (21), the booster (9) and the main filling (11).

f. Method of Neutralising

1. Examine the area around the mine for traps.
2. Unscrew the brass plug (7) without moving the mine or exerting any pressure on the cover.
3. If the brass safety cap (18) is available, screw it firmly into the top of the striker; similarly, if a brass cylinder (19) and washer are available, place them over the brass safety cap (18) and replace the brass plug (7).

g. Method of Disarming

1. Unscrew the plug (7).
2. Unscrew the whole igniter and detonator assembly.

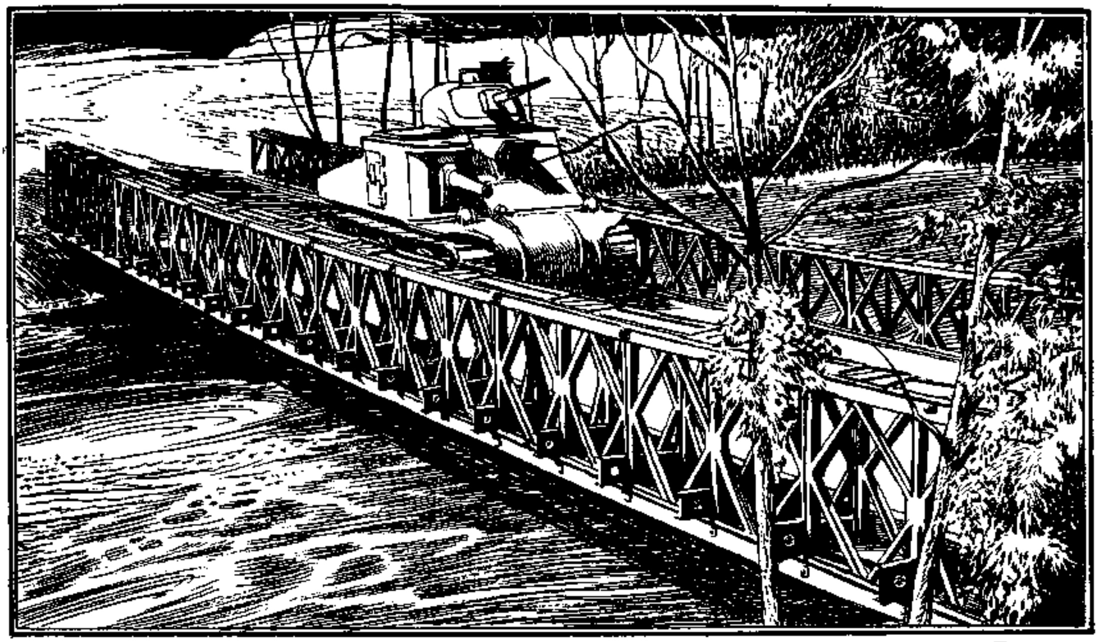
This mine is sometimes called "the tape measure mine" because of its resemblance to a large tape measure case. It is often coupled with other concealed explosive charges to make a formidable booby trap.

12. LAUNCHING THE BAILEY BRIDGE

The British "Bailey bridge" is a knock-down steel bridge, which can be transported in a truck train and erected where needed. With the change of some bolt-head sizes only, it has been adopted by the U.S. Army. The bridge is a "through" type with the roadway carried between the main girders. These girders are formed of panels pinned together to make 10-foot bays. The strength of the girder of 60-foot span can be increased from 20 tons up to better than 80 tons by making it a double-truss, double-story type. The basic unit is a welded, flat-lattice girder 10 feet long, 5 feet 1 inch high, and 7 inches wide, made of high-tensile structural steel, weighing 570 pounds, which can be carried by six men.

[redacted]

The "launching"--or actual placing of the bridge out across a stream--is usually done by pulling the completed structure out and across the stream over



TANK CROSSING DOUBLE-TRUSS. SINGLE-STORY BRIDGE

rollers by means of a "launching nose" or extension, made by pinning on to the end of the bridge the necessary number of 10-foot bays, which extend out ahead of the bridge. The pulling is done by means of suitable cables made fast on the opposite side of the stream. If necessary, of course, the free end of the bridge can be floated, derricked, or cantilevered out across the gap.

The following account from British sources of a method of launching a bridge without the use of the nose extension is of practical value to engineers.

*　　　*　　　*

To reduce the problem of jacking down to one end of the bridge only, it has been found possible to launch a "DS"--double truss, single story--counter-weight instead of the launching nose.

In preparing to launch by this method careful attention to the height of the rollers must be given as there is no nose into which a link can be placed. Launching should be done on a level plane, allowance being made in the calculation for the sag of the bridge and for the base of the end posts projecting 6 inches below the bottom chord as well as for any difference in bank height. A normal layout of stores with stringers placed further back from the rocking rollers than is usual, is satisfactory.

[redacted]

In construction, a normal double-story bridge, less decking, is built to the requisite length. A single-story skeleton tail is added, the bridge being kept as near the point of balance as possible by frequent booming out. The last bay is decked and counter-weight is added according to the table: -

Length of bridge	Length of tail	Counter-weight
60 D. S.	50 feet	2.5 tons - 3 bays of decking
70 D. S.	60 feet	5.1 tons - 6 -do-
80 D. S.	70 feet	5.55 tons - 7 -do-

Counter-weights are calculated with the center line of rollers on center line of base-plate.

On completion, four men are sent to the far bank to position the bearing under the end posts; remainder of the party launch the bridge, pushing downward and outward.

When the bridge has reached the far bank, and the head has been lowered to rest on the base plates, two jacks are placed on the end of the tail and two jacks one bay back from the bridge. Jacking proceeds until the panel pins connecting all but the last bay of the tail can be driven out with a sledge hammer. The tail is jacked down on to the plain rollers and pushed back out of the way. The bridge is now jacked up on the near bank, the rollers are removed and the base plates are positioned. Packing is placed under the remaining bay of the tail. By jacking down on to the packing, the remainder of the tail can be removed. End posts are fitted and the jacking down is completed.

Decking can be fitted and the far ramps placed while the jacking is in hand. The advantages gained from this method of construction are:

(1) A shorter span of bridge than would normally be necessary, can frequently be used.

(2) Jacking down one side only and dismantling the tail after the bridge has been opened to traffic, speeds the time of completion.

(3) Construction is possible with reduced working numbers and equipment.

Note

An American official source suggests that the losses of small tools, which are difficult to replace, will be considerably reduced if bridge erectors, when working over water, will carry them slung around their necks with string. The hide-faced hammers may be adapted for stringing by drilling a hole, or cutting a groove in the handle, near the hand end.

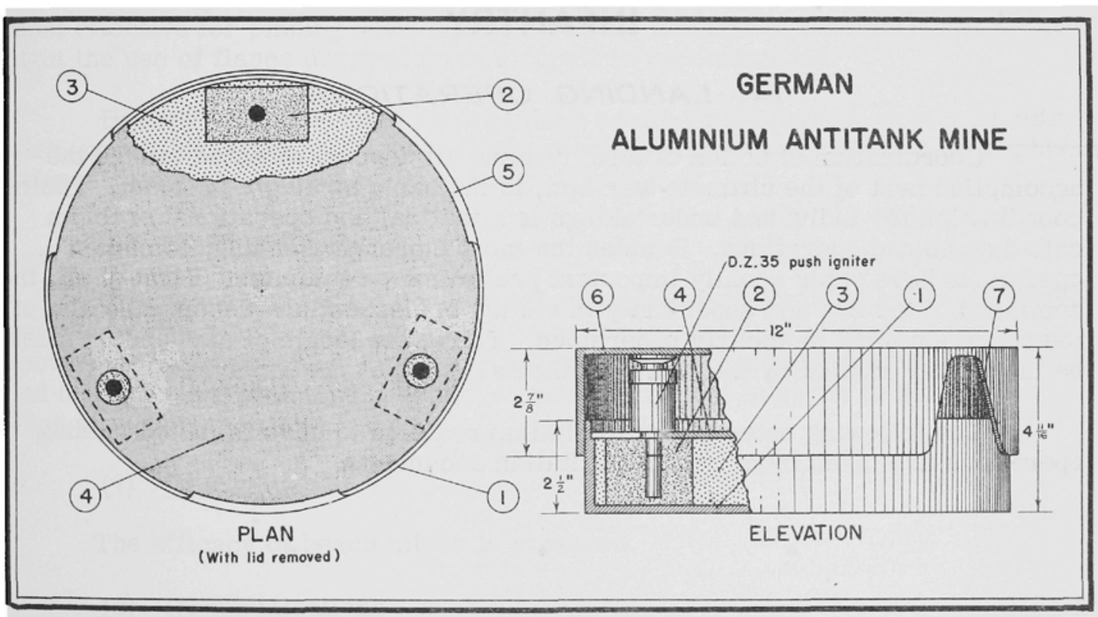
[redacted]

13. GERMAN ALUMINUM AT MINE

In mid-July, officers returning from Tunisia reported the destruction of American equipment in the Mateur area by aluminum antitank mines similar to Tellermines. A question which was raised as to the accuracy of this report has been cleared by a complete description of this mine from official Allied sources. The mine, which is reliably reported to be improvised from scrap aluminum at workshops in the field, based on the design of a German, Major Thomas, may well be encountered in Europe. It is simple in design, but effective. Considerable variation in size may be met with due to local manufacture; Two have been reported.

a. Description

	Example I	Example II
Diameter, body	11 1/2 in	11 1/2 in
Diameter, lid	12 in	12 in
Depth, with lid and igniters	3 3/4 in	5 1/2 in
Weight of filling	7 lbs	9 lbs
Total weight	14 lbs	16 lbs
Igniters--either DZ35 or T.M.Z42		



The mine consists of a circular, flat-bottomed body (1) of 5/36-inch thick aluminum, with 2 1/2-inch high walls. The explosive is made up of three blocks of tolite (TNT), (2) weighing about 6.4 ounces each, containing a hole for the reception of the igniter, the blocks set in cheddite, or a dark-gray, moist, explosive resembling ammonal (3). This charge is covered by an aluminum disk (4), drilled with 3/4-inch holes to correspond with the igniter holes in the tolite blocks and held in place by three burrs (5) on the rim of the body. Like the body, the flat-topped lid (6) is of 5/32-inch aluminum. In three places (7) the sides are cut away

[redacted]

to permit access to the igniters. There is no handle, or any provision for other igniters in the side or bottom.

b. Use

When prepared for laying, the three igniters are screwed into place and the lid put on, resting on the top of the igniters. (If the T.M. Z 42 igniter is used, the lid sits well down over the mine.) The safety-pins of the igniters are then extracted through the openings in the side of the lid. A pressure of about 130 pounds on the side or 390 pounds in the center will explode the mine.

c. To Neutralize

The mine should be examined for the attachment of booby-trap wires. If the booby traps are found, the igniters should be identified and neutralized. In case the D.Z. 35 igniter is found, a short length of wire should be inserted in the safety-pin holes, prior to unscrewing them. Then lift off the cover. The T.M. Z 42 igniter may be lifted out complete with its detonator.

INFANTRY

14. LANDING OPERATIONS

Coordination of action of land, sea and air forces, directed toward the accomplishment of the ultimate war aim, is the basic strategic problem. Their coordination for individual undertakings is a tactical and operational problem called combined operations. Besides the most thorough planning, combined operations have other equally important preliminary requisites. First of all, the command of the sea and superiority in the air are essential. Second, the aim of the operation must be clearly understood. Third, the locale of any landing must be thoroughly studied by the army, by the navy, and by the air arm.

The following notes giving the Italian reaction to certain Allied landing operations are taken from translated Italian documents.

* * *

a. Lessons of Tobruk Landing - 14 September 1942

(1) Surprise

The success of a small-scale landing depends on the attainment of complete surprise. Daily air reconnaissance before twilight of possible convoy routes is therefore of prime importance in a night or dawn attack. Coast watchers must be prepared to function even under air and naval bombardment and should

[redacted]

work in pairs, and if possible under cover.

(2) Organization of Defenses

Command should be unified. Defense plans should be prepared to the last detail but all arms must be prepared to adapt themselves to unforeseen situations.

(3) Air

Air action is particularly effective against ships at anchor and special landing craft.

(4) Naval

It is of greatest importance that ships in harbor should be able to cover the waters of the harbor with fire, particularly the entrance.

(5) Artillery

It should be trained to fire over open sights at targets covered by a smoke screen. Barrages should be laid only when there is no alternative. Artillery is most effective for pinning down attackers at the moment of disembarkation. At night the use of flares dropped from aircraft is recommended.

Battery positions must be organized as all-round defense positions with wire, mines and antitank ditches. They should be covered by the fire of neighboring defense positions.

(6) Counter Attack

To ensure immediate counter attack, reserves should be split up into the smallest units practicable. They should be mechanized, have exact terrain knowledge and if possible, light artillery support. All troops, including services and headquarters personnel should be prepared to join in at the critical moment when the enemy has just landed.

(7) Obstacles

The efficacy of beach mines is stressed.

(8) Communications

Necessity for a maximum number of alternative means of communication, with independent headquarters net work.

Very signals should be kept down to the minimum and only a few unmistakeable signals employed. Color signals should be avoided as likely to cause confusion.

b. Lessons of Dieppe Landing - 19 August 1942

(1) The enemy can land tanks with the first wave but success is likely only if assault troops have first prepared the way for penetration of tanks inland.

(2) Shingle* is a considerable obstacle to movement of tanks.

(3) No area of coast line should be considered as impracticable for landing.

(4) Air superiority, at least in disembarkation areas, is essential for the success of a landing.

(5) When the forces of the defense are limited, in addition to uniform defense of the whole coast, certain points should be selected for "block defense".

(6) Antitank defense in all areas where tanks can be landed or operated should be disposed in depth, particularly along roads and trails.

(7) Artillery positions must be defended by close-defense weapons.

(8) Infantry and artillery must be fully coordinated.

(9) Reserves for counter attack must be mechanized.

(10) Use of smoke by the attackers is liable to disorganize their troops and to make their air support difficult.

(11) Command of the defense must be unified.

c. Defense Against Parachutists in Africa

(1) All mobile elements must regard themselves as "antiparatroops" as well as operating in their normal role.

(2) All battery positions and all headquarters will have attached a permanent group for defense against paratroops.

15. NOTES FROM GUADALCANAL

a. Variations in Japanese Infantry Organization

From time to time changes are noticed in the enemy's infantry organization. Some of these, such as the reduction of L M G and grenade-discharger fire-power within the platoon, have obviously been due to casualties, and in view of their

*Ground covered with loose pebbles and small rocks.

[redacted]

temporary nature, it is not proposed to discuss them here. Others however, indicate planned reorganization, and examples of these are given below. They should be compared with organizations given in Japanese tables of organization.

(1) A four-gun (37-mm) regimental AT gun company (quick fire gun) was identified at Guadalcanal, and there are various other proofs of its existence in the South West Pacific area. In Burma, however, no regimental 37-mm AT gun company has been identified, and antitank guns have been allotted to units from independent antitank gun companies.

(2) Both the four-, and three-rifle-company battalion organizations have been met with in the South West Pacific area, and a battalion organization of three companies has been used extensively in the Arakan campaign in Western Burma, thus reducing a battalion at full strength to about 750. Frequently, the 4th, 8th and 12th companies are lacking.

(3) Another point of interest is the appearance in Burma of two machine cannon in the infantry battalion. This machine cannon is reported to be similar to the 20-mm "Oerlikon" gun, a dual purpose AA/AT gun, with a short barrel. A similar organization has not so far been reported from the South West Pacific.

(4) Finally, it should be noted that 37-mm AT guns have not been identified in the battalion gun platoon either in the South West Pacific area or in Burma.

b. Equipment Carried by a Japanese Soldier During Pacific Operations

One Japanese soldier in the Pacific area had the following equipment which he, and most of the men of his unit, carried during operations.

> Rifle and 150 rounds, two hand grenades, haversack containing five days' supply of rice, two tins of beef, three packets of biscuits, medicine for a stomach trouble, small white tablets for malaria, a water purifier - - one between three men, a bandage, a water bottle, tunic, long trousers, puttees, boots, socks. The soldier stated that originally the men of his unit carried respirators but that most of these had been used as fuel when boiling rice.

c. Front-Line Letters from Guadalcanal

Referring to the letters quoted below, General Marshall, United States Chief of Staff wrote, "Soldiers and officers alike should read these notes and seek to apply their lessons. We must cash in on the experience which these and other brave men have paid for in blood."

These letters were written by the men who, at that time, were fighting the Japanese on Guadalcanal.

[redacted]

(1) A Japanese Trick

"I have been charged twice by the Japs in bayonet charges", wrote a Marine colonel. "Our Marines can out-bayonet-fight them and I know our Army men will do the same. In the last push we executed three bayonet charges.

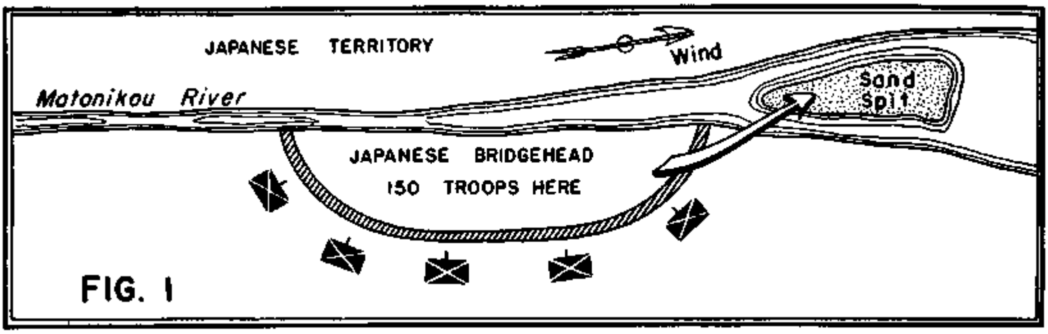


FIG. 1

"A Japanese trick to draw our fire was for the hidden Jap to work his bolt back and forth. Men who got sucked in on this and fired without seeing what they were firing at, generally drew automatic fire from another direction."

(2) Nicknames

"In the Raiders we adopted the custom of dropping all ranks and titles. We used nicknames for the officers. All ranks use these nicknames for us.* We did this because the Nips caught on to the names of the officers and would yell or speak in the night: 'This is Captain Joe Smith talking. 'A' Company withdraw to the next hill'. So we adopted nicknames as code words. Captain Walt becomes 'Silent Lou'. My nickname was 'Red Mike'. An example of the use of these nicknames as code words is: One night the Japs put down smoke and they yelled 'gas'. We were green at that time and two of our companies withdrew leaving 'A' Company exposed on its two flanks. In this instance, I was a battalion commander. Captain Walt called me on the voice radio to inform me of the situation. He was cautious and used nicknames as follows: He said, 'Who is speaking?' and I said,'Red'. He said, 'What name do you identify with 'Silent' ? I said 'Lou'. He said, 'That is correct'. So we both knew that we were talking to each other and were not talking to the enemy. He explained the situation to me. At the end of his conversation, a voice broke in and said in perfect English, 'Our situation here, Colonel Edson, is excellent. Thank you, sir. This is the enemy speaking.' This should be taken as an example of how quick the Japanese are at interception, rather than a hard-and-fast suggestion as to how to outwit them. Any code names or nicknames such as these will have to be changed very frequently, if possible, daily.

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*(In one regiment serving in France in 1918, not only were the officers nicknamed but the companies as well. The first battalion consisted of the Quail Company, the Partridge, the Pheasant and the Grouse. A private was a "pack animal" an NCO, a "workman" and an officer a "boob." This last caused telephonic difficulties with visiting officers.)

(3) They Attack in Bunches

"I can report officially to you that we had nine men killed in one company in the last assault; four of these men were killed by a wounded sniper who had three holes in him. He was lying in thick brush 15 yards from my CP, camouflaged, and had been passed over for dead. You have to KILL to put them out. They attack in bunches, shoulder to shoulder. An example; We were on the Matanikau River (see figure 1.) Our companies were at half strength. This was a Raider battalion plus two companies of the 3rd battalion, Fifth Marines. The Japanese beach-head was a thick jungle with camouflaged standing-type fox holes. They had with them in their beach-head six heavy machine guns and eight light machine guns which we captured in this action.

"At 1830 they smoked our two right companies, and when the smoke had enveloped these two companies, the Japs broke out. They came in a mass formation, 20 abreast, yelling, bayonets fixed, automatic weapons working, rear ranks throwing hand grenades, (white arrow in the sketch, Fig. 1, shows the Japanese route). They were trying to escape to the sand spit at the mouth of the river in order to cross the river to get back. Our right front company had just completed a double-apron barbed-wire fence. When the Japanese hit the left flank of the right company, they killed nine out of the first eleven men they met. Then they hit the barbed-wire. Two of our heavy machine guns opened up, shooting down along this barbed-wire fence and dispersed their attack. It got dark quickly as it does here. There was smoke, Japs and Marines all mixed up. Three Jap officers were swinging their two-handed swords. There was hand-to-hand fighting all night long. We mopped them up at daybreak. We killed 78 Japs. They killed 12 Marines and wounded 26 of us."

(4) Keep Them Moving

"Try to get the Japs on the move; keep bouncing them around; don't let them get set. When you let them get set, they are hard to get out. We have had a great deal of success with the 81-mm mortar and with artillery fire. Here is an example:

"We had the Japs surrounded with their backs to the river, (see Fig. 2). The three battalions were in close contact with the enemy. It was obvious that we had a large number of Japs surrounded and that the best way to get them out was to place field artillery and 81-mm fire on them. However, the problem was to put this fire on the enemy and not on our own troops. The movement which we executed was carefully coordinated with the artillery and with the mortars. Each battalion, at a certain time, was to withdraw just before the firing was due to start. We were very careful to explain to the men what we were doing so that they would not get a mistaken idea of the order for withdrawing. The maneuver was successful. Over 500 Japs were killed in this action. We had 44 Marines killed and 63 wounded. Our men were not hurt by the artillery and mortar fire, of course, but were killed and wounded in the fighting which took place before the withdrawal. After the firing ceased, we went in and mopped up in hand-to-hand fighting."

[redacted]

(5) The Jap Attacks on a Narrow Front

"Most of the fighting here has been at extremely close range, and there has been as much throwing of hand grenades as firing of weapons. No previous report, or even comment, on our enemy and our fighting has been made. For one thing, we do not want to appear boastful, for another, we have been literally so busy we have not had time, really, to think things out.

"Concerning our enemy, several things are apparent. All of his efforts have been in the form of attacks on a narrow front at rather widely separated points. These were mass attacks, and although orders and operation maps captured have shown that they were to be simultaneous attacks, this was never the case. Our feeling is that his failure to estimate the terrain difficulties caused the lack of coordination. The result has been favorable to us, as it has permitted the shifting of our all-too-small reserves from one area to another.

"We believe that the enemy has dispersed his efforts and has therefore failed to make any gain at any one point. When given his choice, he operates exclusively at night. As I said before, he attacks on a very narrow front, practically en masse. This leads to many 'purple nights' when we watch longingly for sunrise. The result for him has been almost complete annihilation in every case. As far as we can determine, these various attacking groups are ordered out, and there are indications that they then pass out of real control of their higher leaders. We have never seen anything to indicate that any effort has been reinforced after the initial push has been made.

The Japanese soldiers fight with a sort of fanaticism and never surrender. We have taken practically no prisoners. Officers about to be taken prisoner sometimes commit suicide. Our translators on the spot were able to get from captured orders, information on which we have successfully operated at once. It causes me to want never to write another order".

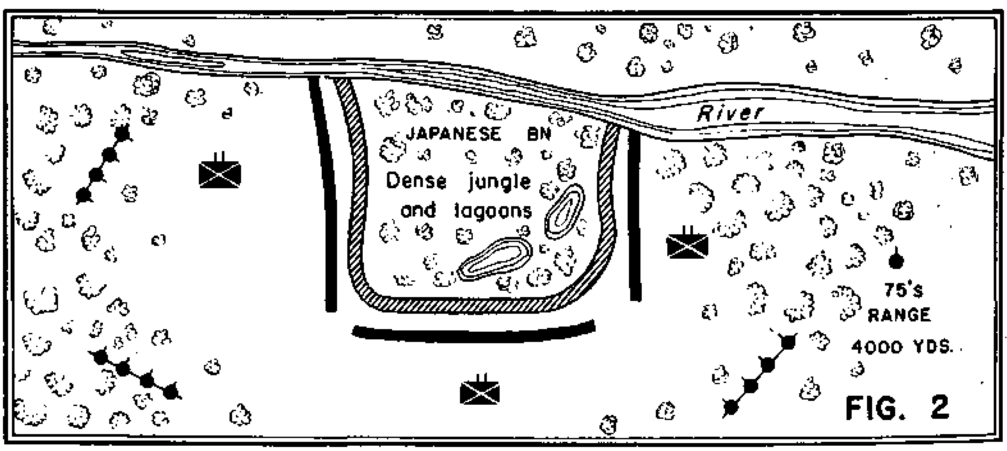


FIG. 2

c. Equipment Carried by the Sniper

Japanese snipers in the Pacific have been reported to carry the following

[redacted]

items of personal equipment: -

Respirator
Green combination mosquito net-camouflage hood (this covers the helmet, head and shoulders.)
Green net to camouflage body
Green eye screen
Coil of rope
Small sack of rice (5 in long)
Small bag of hard biscuits
One-half pound of hard candy
Package of concentrated food
Tin of field rations
Small tin of coffee and vitamin pills
Tin of chlorine (to purify water)
Mess tin
Water bottle
Antidote for mustard gas
Quinine
Stomach pills
Gauze pads
Roll and triangular bandages
Spare socks
Tooth brush
Electric torch
One-half dozen spare lenses for eye holes of respirator
Medical supplies packed in nest of wicker baskets.

It is considered that these items would make the sniper independent for two weeks to one month, requiring only a minimum of food and water from the countryside. It is obvious, of course, that not all snipers are so equipped, but only those required to remain out "on their own" for considerable periods.

d. Identification of Leaders at Night

The following method was used for the identification of Japanese leaders in night operations in the Southwest Pacific.

Company commander--White sashes criss-crossed between the shoulders.
Platoon commander--One white sash across the shoulder.
Section leader--White band around the left arm.

[redacted]

MEDICAL

16. GERMAN MEDICAL SERVICES

The efficiency of the medical services of an army is reflected in the morale and combat effectiveness of that army.

The following details concerning the organization, equipment, and supply system of the German army medical services are taken from an Allied source.

* * *

a. Organization

(1) Infantry Division

2 medical companies, motorized or partly motorized.
2 ambulance platoons, motorized.
1 field hospital, motorized or partly motorized.

(2) Mountain Division

2 medical companies, partly motorized.
2 ambulance platoons, motorized.
1 field hospital, partly motorized.

(3) Motorized Division

2 medical companies, motorized.
3 ambulance platoons, motorized.
1 field hospital, motorized.

(4) Armored Division.

2 medical companies, motorized and armored.
3 ambulance platoons, motorized and armored.

(5) Airborne Division.

3 paratroop medical companies.
1 field hospital (airlanding).

b. Equipment

(1) Of the individual.

(a) The combatant.

One large and one small packet first field dressing wrapped separately in black,

[redacted]

rubberized fabric
1 box anti-vesicant tablets

(b) The stretcher bearer.

1. In the combatant units.

2 stretcher-bearer's haversacks containing:

1 pair of scissors
1 pair of dissecting forceps
6 packets dressing
3 triangular bandages
3 strips of gauze 16 ft x 2 3/4 in
6 squares of gauze
1 roll of adhesive tape
1 waterproof bandage 18 x 20 in
1 tourniquet
20 safety pins.

In the medical units - in this case, the stretcher bearers are not all equipped with the haversack as above, but each group of four has a haversack (Verbandtasche) containing:

1 pair of cloth-cutting scissors (Kleiderschere)
1 tourniquet
12 strips of gauze
10 squares of absorbent cotton
6 triangular bandages
2 "Brandbinden" (absorbent gauze treated with bismuth for burns)
1 waterproof bandage 36 x 40 in
4 rolls rubberized adhesive tape
35 safety pins
4 small splints with cradle
2 slings, 12 x 5 in
Each stretcher bearer also carries a mug and a bottle with about a pint of cordial.

(c) The Medical Service N.C.Os. and Medical Orderlies.

Each carries a bottle of cordial, a case of dressing material and two medical haversacks, the first containing medicines such as salicylic acid (2%), formaldehyde, ticture of iodine, cardiazol and opium; the second containing much the same dressing material as the stretcher bearers' haversack on a smaller scale.

(d) Officers of the Medical Services.

Each carries the officer's haversack, the contents of which are extensive, including a number of surgical instruments such as probes, lancets,

[redacted]

ligature forceps, cannulae, vaccinostyles and the like; a certain quantity of dressings; a tin plate case for tablets containing among others, pyramidone, veronal, acetylsalicylic acid, codein phosphate, tannalbin, opium, cocain chloride, atropine-mannite and calomel; and also a box containing ampoules of, for example, caffein sodium salicylate, superarenine chloride and morphin hydrochloride.

(2) Of a Combatant Unit.

The medical equipment of battalions and regiments is identical. It comprises:

(a) Box No. 1. This is the "Battlebox" (Gefechtskasten) and is marked with two white strokes in the form of a cross. The contents are miscellaneous but include much dressing material, anti-tetanus serum, medicaments and two 6-in atomizers containing ethyl chloride.

(b) Box No. 2. Medicaments of all types (Arzneimittelkasten).

(c) Box No. 3. Dressing Equipment. (Verbandmittel).

(d) Box No. 4. Supplementary box. This is like No. 1, but on a smaller scale.

(e) Box No. 5. Contains 280 flasks of tetanus anti-toxin 3000 units per c.c.

(f) Two medical haversacks containing medicaments and dressings rather on the scale of the M.O's haversack. Two empty rucksacks are also included, with blocks of labels for wounded and for sick.

(g) One set of equipment for fractures, including cardboard splints, metal wire splints and aluminum splints.

(h) One unit medical outfit - like an M.O's haversack.

(i) One set of oxygen apparatus - the flask contains 275 quarts of oxygen.

(j) Four stretchers.

(k) Twelve woolen blankets.

(l) One filter apparatus.

(m) Anti-vesicant, and gas protection caps for those with head wounds.

c. The Evacuation of Casualties

(1) Units under Divisional control. There are no medical units allotted

[redacted]

to corps normally.

(a) Battalion aid station (Verwundetennetz) as close to the fighting line as possible. The station may or may not be under cover. Treatment is restricted to first aid. Occasional blood transfusions may be done. Evacuation is by stretcher bearer section of medical company.

(b) Ambulance Station (Wagenhalteplatz). This is established only if the ambulances cannot go forward to the battalion aid station.

(c) Field Clearing Station (Hauptverbandplatz) is established by the Medical company. It is intended for serious casualties requiring resuscitation, adjustment of dressings, splints etc, arrest of hemorrhage or blood transfusion before further evacuation. Emergency operations may be done here.

(d) Lightly Wounded Collecting Station (Leichtverwundetensammelplatz) for walking wounded and sitting or reclining cases requiring only minor treatment before evacuation. There is a skeleton staff from medical company. The remainder of the medical company is normally in reserve - - available to assist in handling a sudden rush of cases or assist in bombed areas, etc.

(e) Division Field Hospital (Feldlazarett). Capacity 200 beds. It is intended for the reception and retention of casualties who require urgent operation or resuscitation and a few days rest before further evacuation. It has a surgical team and is fully equipped to handle any casualty.

Hospitals at Home or in Occupied Countries. (Reservelazaretten)

(a) Casualty Collecting Station (Krankensammelstelle). It is established by an Army ambulance unit at a railhead or other traffic center, normally and is for the retention of casualties awaiting evacuation. Only minor treatment is possible.

(b) Army Field Hospital (Kriegslazarett). For more serious casualties. Capacity 500 beds. Fully equipped hospital with all specialist departments.

(c) Army Field Hospital for lightly wounded cases. (Leichtkrankenkriegslazarett) Takes casualties who will be fit for duty in 3 or 4 weeks. Capacity 1,000 beds; fully equipped. Normally located in back areas of Army zone and away from all large towns.

Capacity and time of erecting or dismantling of various units.

(a) Army Field Hospital. Capacity 500 beds, 24 hours to set up or dismantle. Set up by Army medical detachments.

[redacted]

(b) Army Field Hospital for slightly wounded cases. Capacity 1,000 beds. 24 hours to set up or dismantle. Set up by Army Field Hospital detachments.

(c) Field Hospital. Capacity 200 beds. 3 hours to set up or dismantle. Set up by Army Medical detachments.

(d) Casualty Collecting Station medical railhead. Capacity limited only by the available accommodation. 3 hours to set up or dismantle. Set up by motor transport ambulance company.

(e) Field Dressing Station. Unlimited capacity. 1/2 to 1 hour to set up or dismantle. Set up by Divisional medical company.

(f) Slightly Wounded Collection Station. Unlimited capacity. A few minutes to set up or dismantle.

(g) Motor Ambulance. Capacity of 4 lying and 10 sitting. Has four driving wheels and double differential for cross country performance.

(h) Hospital Train. The 2- or 3-axled coach train with heating coach has 358 lying capacity, and 383 sitting capacity without heating coach. The 4-axled corridor coach train with or without heating coach has a 364 lying capacity. 2 to 6 hours to set up or dismantle.

(i) Hospital Train for Slightly Wounded. 920 sitting capacity. 1 to 2 hours to set up or dismantle.

ORDNANCE

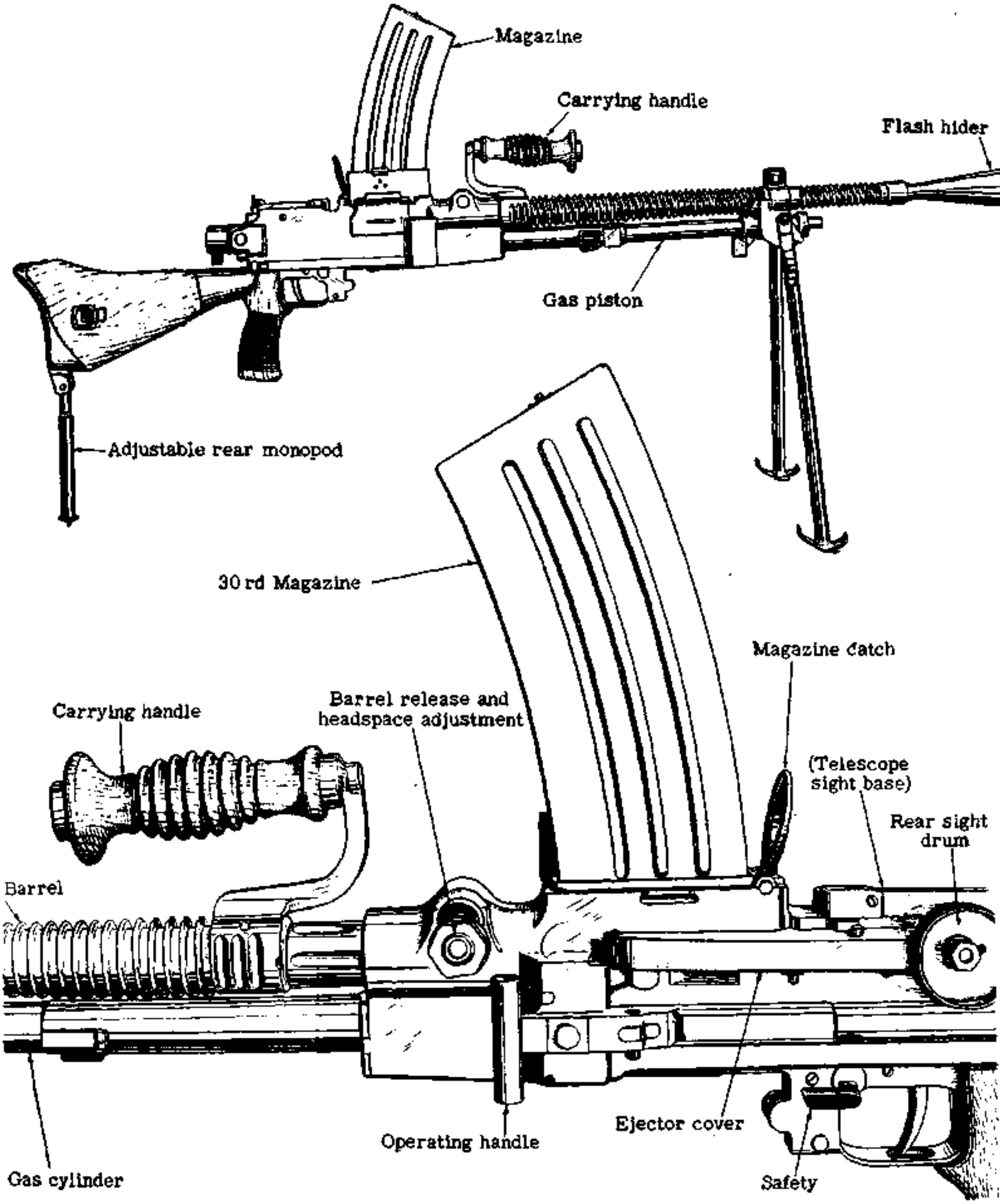
17. JAPANESE MODEL 99 MG

The Japanese Model 99 (1939) 7.7-mm caliber light machine gun, a weapon of relatively recent development, (see accompanying sketch) is very similar to the Model 96 (1936) 6.5-mm gun. Nearly all variations result from the change to the larger caliber. The general characteristics as reported by the Aberdeen Proving Grounds, follow:

Weight w/o magazine	20 lb
Overall length	42 in
Weight of barrel	6 lb
Length of barrel	21 3/4 in
Rifling	4 lands and grooves (left hand uniform twist)
*Rate of fire	800 r p m (automatic fire only)

*Not checked by Proving Ground Test.

[redacted]



JAPANESE 7.7-MM MG, MODEL 99

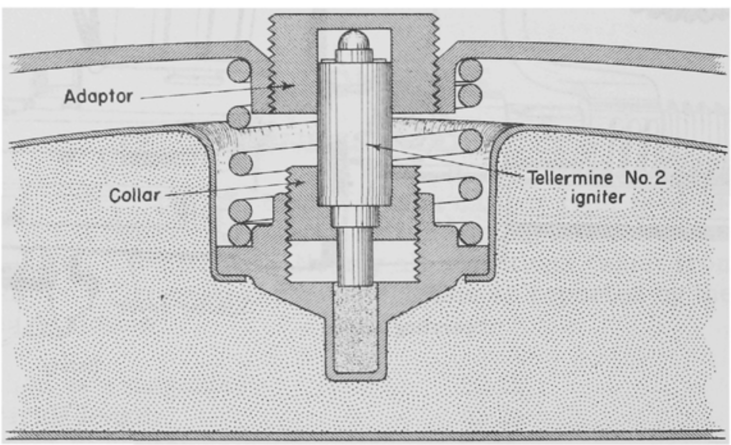
[redacted]

*Muzzle velocity	2,300 f p s
Front sight	Flat post
Rear sight	Drum type with click adjustment for windage and elevation.

An adjustment for headspace is incorporated in the barrel retaining bolt. A tapered groove is cut into the barrel near the breech and a corresponding tapered surface is milled into one side of the locking bolt. As the locking bolt is drawn from left to right by means of a large hexagonal nut which pivots on the outer end of the bolt lock and screws on to a fixed collar, the barrel is forced to the rear, thereby decreasing headspace. The bolt lock nut is marked from 1 to 8. On the forward face of the receiver, to which the barrel is held in close contact, a washer is provided so that the replacement can be made as excessive wear occurs. The washer is about 1/16 inch in thickness.

An adjustable rear monopod is provided which is mounted in a recess in an extension of the butt plate. A flash hider is screwed onto the barrel in the conventional manner rather than attached by a bayonet-type lock as is found on the Model 96. The staggered box-type magazine is longer and slightly less curved than the one used for the Model 96. The safety lever on the Model 99 is located on the left side while on the Model 96 it is on the right. Ammunition for the Model 99 light machine gun is rimless.

18. MINE IGNITER ADAPTATION



When the igniter assembly of the German Tellermine No. 2 is used with Tellermine No. 3, two additional parts are required, as shown in accompanying diagram. The additional parts are, a collar to receive the igniter in the central well and an adaptor screwed into the hole to transmit the pressure to the striker head. Tellermines No. 2 and 3 were described in Tactical and Technical Trends, No. 28, pp. 17, 18, and 19.

*Not checked by Proving Ground Test.

[redacted]

19. 380-MM SPIGOT MORTAR BOMB

Some details of the ammunition for the 380-mm (15-in) Spigot Mortar (Schwerer Ladungswerfer) are now available. Both smoke and HE bombs are fired by this weapon, but the following data refers to the HE bomb.

German name	38-cm Wurfgranate 40
Total weight	331 lb
Bursting charge	110 lb
Maximum diameter	15 in
Length overall	4 ft 11 in
Length of bomb	2 ft 3/4 in
Fuze	Wgr. Z 36, a standard percussion nose fuze as used in German mortar bombs.
Gaine*	Zdlg. C/98 Np., a standard gaine containing Penthrite.
Propellant	There are two charges contained in cloth bags in an adaptor fitted with an electric primer. The propellant is known as Gudol, (see Tactical and Technical Trends, No. 31, p. 37) and is a flashless double-base propellant containing nitroguanidine. Weights are as follows: Charge 1, 385 grams (13.56 oz); Charge 11,175 grams (6.19 oz).

SIGNAL CORPS

20. GERMAN FIELD TELEPHONE BATTERIES

It has been reported from a German source considered to be well informed, that the batteries used for field telephones in Africa contained acid of which the specific gravity was 24°, Baume.** For service in extreme heat, this figure is reduced, while in Europe it would be 27° or 28°. The batteries were made of wood, lined with an acid-proof matrix described as "pitch - tar mould". The voltage for telephone use was stated as 1.5. After six months, the batteries became exhausted. They resembled a single cell from a pocket flashlight battery, of the type which usually has 4.5 volts. In this particular case, the cell was enlarged for greater amperage.

The German signal corps is reported to be furnished with a field live-testing set, battery operated, which can measure voltages as high as 300 amps, also resistance. It can be used to test lines and elements, with or without load.

From the same source as the previous item comes an account of a special cable covered with synthetic rubber, over which a tank can pass without injuring it. Such cable is supplied in drums of 273 yards length. To lay, a truck would drive the length of the cable on the drum, unreeling the cable, which is then

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*The metal casing of a shell holding the explosive.

**Equivalent to 1.199 specific gravity.

[redacted]

connected with the second drum, and the truck proceeds. It was stated that in this way 2 or 3 km (1.22 to 1.86 miles) of cable could be laid in from 20 minutes to half an hour.

The cable is reported to carry two pairs, which, it was stated, could be used for multi-channel traffic for both teletype and telephone.

[redacted]

SECTION II

RECRUITMENT OF THE WAFFEN-SS

STURMBANNFÜHRER (MAJOR) **WAFFEN—SS OFFICERS** HAUPTSTURMFÜHRER (CAPTAIN)

[redacted]

[redacted]

RECRUITMENT OF THE WAFFEN-SS*

Despite a general relaxation of requirements in the acceptance and induction of men for the German armed forces, rigid standards are reported to be maintained in the recruitment, within Germany, of that elite organization known as the Waffen-SS. Outside the German borders, however, standards are reported to have been lowered in the recruiting of Volksdeutsche (German-speaking persons domiciled outside Germany) and of non-Germans.

Because of this difference it is deemed advisable to consider Waffen-SS recruiting activities inside and outside Germany under separate headings:

a. Inside Germany

The basic conditions of recruitment are:

(1) A standard of physical fitness at least equal to that required by the Army.

(2) "Aryan ancestry" and National-Socialist beliefs. Standards of height vary for different units. For the Adolf Hitler Bodyguard (Leibstandarte) the minimum is 5 feet, 10 inches. For the ordinary SS divisions it is 5 feet, 7 inches, or for men under 21 years of age, 5 feet, 6 inches. For mountain troops, the minimum is 5 feet, 5 3/4 inches.

Recruits are accepted in four categories, as follows:

(a) Volunteers for the duration
(b) Volunteers for 4 1/2 years) With the prospect of becoming non-commissioned officers
(c) Volunteers for 12 years)
(d) Officer candidates.

Age limits for volunteers for the duration are 17 to 45 years excepting that recruits for infantry, armored, and signal units must not be more than 25 years old. Enlistment for the 4 1/2 year period is restricted to men between 17 and 35 years of age and, for the 12 year period, to men between 17 and 23.

Officer candidates are classed either as "technical" or "active." Age limits for the latter are 17 to 23 years. Preference is given to Hitler Youth leaders, Party functionaries, and officials in organizations affiliated with the Party.

An "active" officer candidate must serve a qualifying period of 12 months--six in a replacement training unit, six in a field unit--before going to one of the two SS officer training schools (SS-Junkerschulen). If he passes his preliminary tests there, he becomes an SS-Junker. When he is graduated, he becomes an SS-Standartenober-junker and is assigned to a unit. Promotion to Untersturmführer

*Military branch of the Nazi Party "Elite Guard."

[redacted]

(2d lieutenant) follows upon the recommendation of his commanding officer to the head of the SS.

Technical officers undergo much the same kind of training except that after six months of general military training they are attached for three months to the arm of service they have chosen, to learn the practical side, following which there is a three-months theoretical course.

While the Hitler Youth organization is the main source of recruits for the Waffen-SS it must be remembered that the Youth group is equally the main recruiting source for the Wehrmacht. As the HJ (Hitler Youth) has been actually as well as legally compulsory since 1940, the number of boys leaving that organization each year is now practically equivalent to a whole annual age class. Of these a small proportion, probably between fifteen per cent and twenty per cent are accepted as Party members and not all of these have in the past joined the Waffen-SS.

Since the beginning of 1943 strenuous efforts have been made to induce boys of 16 and 17 to join the Waffen-SS. Propaganda stories concerning SS troops in action frequently appear in HJ publications; SS men are detailed, together with representatives of the Wehrmacht, as instructors in the boys' military camps. There is reason to believe that in many cases the pressure exerted on the youths to "volunteer" is tantamount to compulsory enlistment.

The Waffen-SS is not empowered to recruit from the Wehrmacht itself. Recruits already mustered for the Wehrmacht but not yet called up may volunteer for the Waffen-SS, but men who have been called to service or who are serving or who have served in the Wehrmacht, are, as a class, placed outside the range of SS recruiting. Also, men with technical training or qualifications fitting them for service in the Air Force or in the Navy are barred from applying to join the Waffen-SS as officer candidates. There is one modification to these general prohibitions. Officers, and presumably enlisted men also, may be permitted to transfer from the Wehrmacht to the Waffen-SS in exceptional cases and at the discretion of the High Command. But there is no reason to believe that such transfers occur frequently or have any vital bearing on the recruiting problem of the Waffen-SS.

It is evident that the Waffen-SS is finding increasing difficulty in getting enough recruits by the voluntary method to replace heavy battle casualties as well as to maintain the present rate of expansion.

b. Outside Germany

Methods of recruiting have varied in the different countries, but a broad difference is discernible in the appeals made to the Volksdeutsche, to whom the German government can speak with a show of national authority even when they are citizens of another state, and the other nationalities who must be induced to enter the Waffen-SS on grounds of local or European patriotism.

[redacted]

The main groups of Volksdeutsche outside the Greater Reich are in Hungary, Rumania, Croatia, and Slovakia. A report of January 1943 on the German minority in Hungary stated that 3,500 were serving in the Wehrmacht, 10,000 in the Hungarian militia, and 20,000 in the Waffen-SS. Of the 70,000 Volksdeutsche from Rumania in the German fighting services, a majority are said to be in the Waffen-SS. In Croatia complete conscription has been introduced and all physically fit German males from 17 to 35 years of age, not already serving or otherwise exempt, are being called up for service in the Waffen-SS. Similar action has been taken in Slovakia. These are the first clear cases of wholesale conscription for the SS, though it can scarcely be doubted that there has been much pressure, if not actual compulsion, among the other Volksdeutsche groups. Several thousand Volksdeutsche from Russia have also been absorbed into the Waffen-SS.

The original decision to raise non-German forces to serve with the Waffen-SS was based on the propaganda rather than on the fighting value of the "Germanic" volunteers. For this reason, apparently, the men were mostly organized in small national legions.

In Scandinavia and the occupied countries of the West, recruiting was done mostly by the local Nazi and Quisling parties; in the Baltic states it was done by the German-controlled governments; in the Balkans by German authorities in agreement with the governments concerned. In all these territories the Waffen-SS has obtained a virtual monopoly on recruiting for the German armed forces.

During the last six months, interesting changes have been noticed. With manpower becoming more important than propaganda, a larger element of compulsion has entered the recruiting campaigns, and at the same time the small, uneconomic legions are being reorganized into regiments and battalions, clearly intended to be incorporated into regular SS divisions.

In the occupied countries of Scandinavia and the West, the demand for recruits has been particularly noticeable since the early spring of 1943. The various Quisling leaders have addressed themselves especially to their followers, and demanded from them an offer of their services at the front as a test of their political integrity. The position has been most bluntly defined by the Senior SS and Police Leader, Rauter, in Holland. "It is quite obvious," he said in a speech in March, 1943, "that every SS man in his turn will have to experience battle on the East front. An SS man who thinks he cannot face this is not a true SS man and cannot become a leader. In principle, every SS man should apply for service at the front."

In Estonia, Latvia, and Lithuania the recruiting campaign is more intense. Considerable governmental influence has been exerted to make young men, members of the Civil Defense Corps, and ex-soldiers join the Waffen-SS, or at least one of the auxiliary organizations of the Wehrmacht.

The head of the civil administration in Estonia recently told a gathering of Estonian SS legionaries that he was ordering all commissioned and noncommissioned officers of the former Estonian army, in conformity with their oath to defend the

[redacted]

country, to join the SS legion, and that he was also contemplating the calling up of younger age-groups to bring the organization up to full strength. According to reports from various sources this was done and approximately 16,000 men were mobilized, the majority of whom seem destined either for the Estonian SS legion or for auxiliary service with the Wehrmacht.

The intensified drive for recruits in the occupied countries has been accompanied by a lowering of the physical and ideological standards demanded of them. The difference is best illustrated in Norway. In the original recruitment (1940-41) for SS-Regiment Nordland, men between 17 and 23, unmarried, Aryan, and of good physique, were invited to volunteer for one, two, or four years. In 1941 the upper age limit was raised to 40 years. In the present recruiting campaign for SS-Panzer-Grenadier-Regiment Norge (replacing the Legion Norwegen), enlistment is open to all Norwegians between 17 and 45 years of age, whether married or single, with a minimum height of 5 feet, 5 inches.

In Latvia and Lithuania the recruiting notices ask for men between 17 and 45 years of age, Aryan, with no criminal records, and mentally and physically fit. This is probably now the general standard for the foreign SS recruits.

At the same time, less attention is being paid to the political and racial qualifications of recruits. Apart from the mass conscription of Croats and Estonians, there have been other indications that Nazi ideology is no longer regarded as an indispensable qualification. In Norway the advertisements for what are described as "peaceful Waffen-SS duties" inside the country assure prospective recruits that enlistment carries with it no political ties. An even greater tolerance has been shown in the Balkans, where a Croatian SS division has been formed of Catholic and Moslem Croats. The acceptance by the Waffen-SS of recruits who are neither Germans, "Aryans" nor Nazis and who are of a race and religion essentially alien to Europe, suggests that the original conception of "SS-Tauglichkeit" ("Aryan" ancestry and National-Socialist beliefs) has been abandoned.

It is clear that recruiting of Volksdeutsche and non-German elements for the Waffen-SS is mainly determined by the political situation in the countries concerned. Where the population is considered reliable the SS are prepared to do mass recruiting; where it is unreliable, a measure of selection is still deemed necessary. Hence with Volksdeutsche and the Baltic populations, among whom a considerable degree of pro-German or anti-Russian feeling may be reasonably expected, an amount of pressure has been used which is hardly distinguishable from general conscription. In Scandinavia and the Low Countries, where the population is in general anti-German and the Quisling governments are not firmly established, recruiting is voluntary and appeals mainly to those who have already taken sides with Germany. Finally, the Croatian division is purely an opportunist measure, exploiting the existing political and racial divisions in Yugoslavia.

The outstanding feature, however, is the difference between the SS recruiting inside and outside Germany and the consequent differences in kind between the various SS Divisions. That the SS will endeavor to guard against this dangerous

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dilution by providing the impressed or mercenary troops with German officers is almost certain. But even this cannot alter the fact that a potential source of disintegration has been introduced into the elite corps of National Socialism.

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TACTICAL AND TECHNICAL TRENDS

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WAR DEPARTMENT · · · WASHINGTON, D. C.

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Number 36

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SECTION I

1. DORNIER 217-E

The number of improvements found in the various types of the Do-217 appear to make this aircraft a profitable subject for further comment in view of its many diverse uses as a long range heavy bomber, minelayer, and reconnaissance airplane.

The armament of the 217-E usually consists of one 20-mm Oerlikon cannon or a 13-mm machine gun on a free mount in the nose, one 15-mm machine gun fixed in the bottom of the nose, firing forward, one 13-mm machine gun in an electrically-operated dorsal turret, a 13-mm machine gun on a free mount in the ventral position, and two 7.9-mm machine guns on free lateral mounts. In a recently crashed airplane, two sets of twin 7.9-mm machine guns were found. It is believed that they are now being used for lateral protection instead of single machine guns of the same caliber. The most recent change found in Do-217 armament is the addition of three fixed, rearward-firing guns. One is in the extreme tail and one is in the aft end of each engine nacelle. A master switch and a cocking switch are provided for the pilot and there are three firing buttons, one each for the pilot, dorsal gunner, and ventral gunner. The circuits would allow the firing of either 7.9-mm or 13-mm machine guns. It is possible that a 30-mm gun will be fitted on a few of these aircraft for use as tank-busters. The night-fighter version of the Do-217 has four 20-mm fixed cannon in the nose in addition to four 7.9-mm machine guns. It has been reported that an experimental model is now being developed which will carry eight cannon and four machine guns.

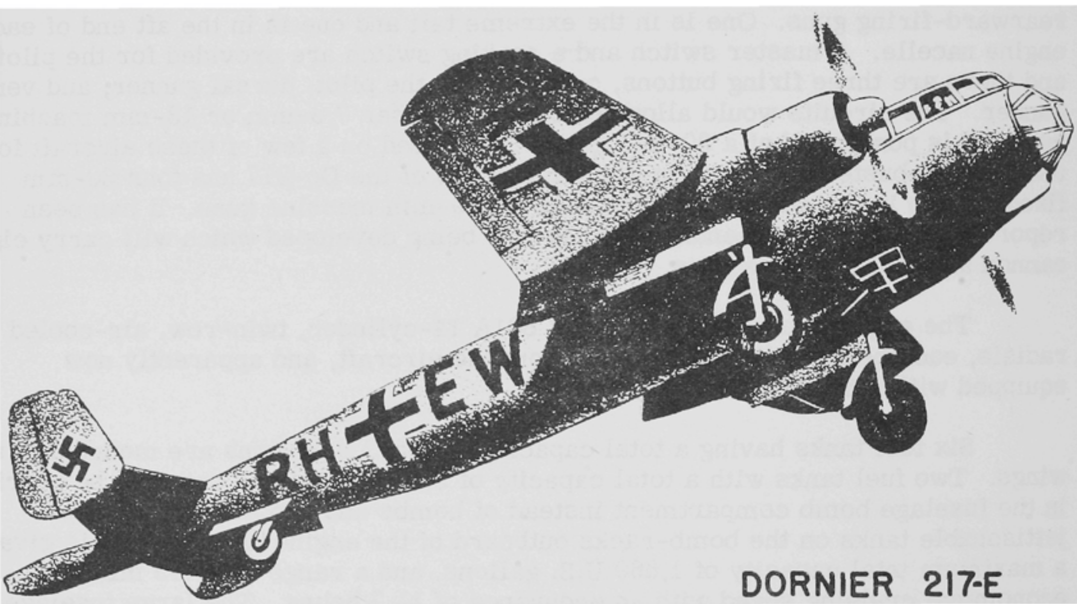
The engines are the usual BMW 801A 14-cylinder, twin-row, air-cooled radials, each being easily detachable from the aircraft, and apparently now equipped with a modified exhaust system.

Six fuel tanks having a total capacity of 785 U.S. gallons are mounted in the wings. Two fuel tanks with a total capacity of 399 U.S. gallons can also be carried in the fuselage bomb compartment instead of bombs and two 238 U.S. gallon jettisonable tanks on the bomb-racks outboard of the engine nacelles. This gives a maximum total capacity of 1,660 U.S. gallons, and a range of 2,445 miles at economical cruising speed with an endurance of 11.7 hours. The large fuselage fuel tank on the E-4 sub-type consists of a metal shell covered with self-sealing material, the first metal shell tank to be seen in a bomber.

The aircraft has a normal bomb load of 4,400 pounds, and a maximum of 6,600 pounds. Normal stowage consists of either four 1,100 pound and four 110 pound internal bombs or two 2,200 pound internal and two 550 pound external bombs. There is also provision for carrying torpedoes, but the Do-217 is not frequently used as a torpedo bomber.

The armor on the Do-217 E is reasonably comprehensive. The pilot's seat is protected by 5-mm (.197 in) plate, the back of which is attached to an 8.5-mm (.33 in) plate back-shield which moves it so that the pilot is always protected at any position of seat elevation. A piece of 9-mm (.354 in) plate in the roof of the cockpit, slightly aft of the pilot's head, gives him protection from above. For protection of the dorsal gunner, the top of the fuselage aft of the turret is armored with two

6-mm (.236 in) plates, on either side of which is a 6-mm curved triangular-shaped piece extending down over the sides of the fuselage. The rise of the turret above the fuselage is protected by a 9-mm (.354 in) circular plate made in four sections and about 12 inches high. The ventral gunner is protected in front by a 10-mm (.394 in) vertical plate, cut away for operation of the gun, and from below by 5-mm (.197 in) plates. One report states that he is also protected by an 8.5-mm (.335 in) semi-circular bulkhead 3 feet 9 inches by 1 foot 8 inches, placed aft of his position. There is no known protection for the lateral gunner. It has been reported that a 6-mm (.236 in) semi-circular bulkhead is fitted into the engine nacelles to protect the lower half of the engine and its accessories. The dinghy recess in the top of the fuselage about in line with the trailing edge of the wing, is armored with 8-mm (.315 in) rear plate, 4-mm (.157 in) plate on the sides and bottom, and 5-mm (.187 in) plate on the cover.



DORNIER 217-E

Some of the aircraft examined were wired and equipped for electrically operated dive-brakes, and an automatic pull-out device. The umbrella type dive-brake in the tail of early Do-217's proved unsatisfactory and the newer models have a five-slat type brake installed under the wing outboard of the engine nacelle, nearer the leading edge than the trailing edge of the wing.

In addition to the large dinghy, which is omitted in later models, each of the crew of four is provided with a single-seat dinghy, carried with their parachutes.

The F-Gerät radio altimeter, a device for measuring by radio the actual height of the aircraft above the ground, has been found in some aircraft. Usually a knife-edge cable-cutter is fitted, faired into the leading edge of the wing and around the nose.

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ANTIAIRCRAFT

2. GERMAN 88-MM DUAL-PURPOSE GUN

The new German antiaircraft-antitank 88-mm (3.36 in) gun (8.8-cm Flak 41) was described in some detail in Tactical and Technical Trends No. 29 p. 5 with two sketches of the gun on page 6. The following additional details are taken from a report on three damaged guns of this type that were recovered in North Africa.

*　　　　*　　　　*

a. The Gun

The barrel which has an overall length of approximately 666 centimeters (21.1 ft) or about 76 calibers, is built up in the same manner as the 88-mm Flak 36 with a securing collar at the forward end of the jacket.

The gun slides on a cradle on guideways secured to the jacket and breech ring. The breech ring is prepared to receive the various parts of the breech mechanism and the automatic rammer. On top of the breech ring is a lever secured to the end of a shaft at the outer end of which is mounted the female portion of a dog clutch. The male portion of the clutch is secured to the end of the recuperator piston rod. Underneath the breech ring is a lug for attachment to the buffer mechanism. The breech block is of the horizontal sliding block type. Additional data follows:

Height of trunnions	108 cm (42.5 in)
Maximum elevation	88°
Maximum depression	-8°
Traverse	360°

b. The Mounting

The mounting has a platform which rests squarely on the ground when in firing position. Four stabilizing pickets are provided; these are driven through prepared slots in the legs of the platform. For transport, a four-wheeled carriage is provided on which the platform is raised or lowered on a three-point lift by chain winches. The carriage appears to be identical with that of the 88-mm Flak 36.

(1) The platform consists of a longitudinal girder having a wide diamond-shaped center. At the side points of the diamond are bearings which take the two side members. These swing sideways and forwards when in travelling position. They are locked in the firing and travelling position by "D" pins. Large oblong levelling pads are mounted at the end of each of the four legs. A "T" spirit level is provided on the right side of the body just behind the traversing handwheels. In the center of the diamond is a circular base-plate on which the body pivots.

(2) The body consists of a rectangular base with two sidepieces shaped roughly like a right angled triangle with the right angle at the base at the forward

[redacted]

end. The side pieces are approximately 2.8 meters (9.2 ft) long and 1.2 meter (3.9 ft) high at the front. On the left sidepiece are mounted twin fuze-setting cups, lying horizontally one above the other. A seat is provided at the forward end for the fuze-setting number of the crew. On the right sidepiece at the forward end is mounted the traversing gear (two parallel handwheels with receiving dials) and an adjustable seat; at the rear end is the elevating gear (two handwheels and dials) and two adjustable seats. At the front of the body is provided a traverse travelling-clamp.

(3) The cradle is bolted on to two massive half-brackets carrying the trunnions which are mounted at the extreme rear of the body. The right trunnion supports a quadrant elevation reader arm and a sight reader arm. The buffer mechanism lies inside the cradle. The recuperator (and automatic rammer) is mounted above the piece and is attached to the cradle by means of a heavy triangular bracket at the rear, and a lighter frame, on which is set a small shield, at the front. A recoil indicator is mounted on the right hand side, reading from 700 to 1,190 mm (27.6 in to 46.9 in).

The elevating arc is secured, under the center of the cradle, to the brackets carrying the trunnions. A dial-sight carrier is mounted above the recuperator cylinder.

(4) Compensators are fitted and lie along the inside base of the side-pieces, one on each side. They are operated by large springs which are attached to the rear of the cradle by two sets of 11-strand cables.*

(5) Firing mechanism. The gun is fired electrically. A push button is secured to the right footrest of the traversing number.

(6) The shield consists of the following parts in addition to the small portion attached to the cradle. The center section is made up of two sheets of 7-mm (.27 in) metal, 1 meter (3.28 ft) in width and 1.5 meter (4.9 ft) in height, set 36 centimeters (14 in) apart on each side of the piece. Two hinged side pieces are provided, 78 centimeters (30.7 in) in width. For a depth of approximately 20 centimeters (7.8 in), the whole of the top of the shield is set back at an angle of about 30 degrees.

(7) Fuze setter. The mechanism appears to be essentially similar to that on the Flak 36 consisting of a flywheel and the electric receiving-dial and circular scale for fuze readings. The dials are set in the front of the machine so that the fuze number faces to the rear of the piece.

(8) Sights. The telescopic sight used is the Z.F.20 E6 fach 8.8/41, which differs slightly from the Z.F.20E sight used with the 88-mm Flak 36. It has the following optical characteristics:

*The source material states, "two sets of 11 cables."

Magnification	x6
Field of view	11°
Exit pupil diameter	4 mm
Moderating glasses	Plain glass Light neutral Dark neutral Intensely dark neutral for sun shots.

The illuminating window is at right angles to the axis of the eyepiece. The range drum is graduated every 100 meters (109 yds) from 0 to 12,100 meters (13,189 yds) being numbered every 1,000 meters (1,093 yds) from 0 to 7,000 meters (7,630 yds) and every 500 meters (545 yds) from 7,000 to 12,000 meters (13,080 yds). Other features of the sight, including the T.E. drum, are similar to the Z.F.20E sight.

ANTITANK

3. MAGNETIC AT HOLLOW CHARGE

Information recently obtained reveals that the German magnetic antitank hollow charge, Haft-Hohlladung 3 kg (6.6 lbs), is now being used in two types, one fitted with a 7-second delay igniter and the other fitted with a 4.5-second delay igniter. The latter type was described in detail in Tactical and Technical Trends, No. 23, p. 3.

The two types can be identified by the colors of the igniter-caps, the old type being painted blue while the new, 7-second type is yellow.

According to a German document on the destruction of tanks at close quarters, this charge is apparently placed on the tank; there is no mention of its being thrown.

ARMORED

4. GERMAN ARMOR AGAINST A BRIDGE

The following article, taken from a German military magazine, is of interest as emphasizing certain elementary tactical principles, which, though well known and frequently discussed, are sometimes forgotten in combat.

* * *

[redacted]

How Should Tanks Attack a Bridge?

a. First Example

(1) Situation

The Russians were withdrawing toward the north. On the previous day they had been thrown out of an improvised fortified position. A German tank battalion with attached units was ordered to pursue the enemy.

(2) Mission

The battalion was ordered to occupy the stream sector with the bridge in a village and overtake and destroy the retreating enemy.

(3) Friendly Troops

The battalion had 23 tanks -- the 1st Company, 18 -- all PzKw 3s, of which 10 were taken over from another battalion on the morning of the day of attack. They were manned by crews which had not been trained to work as a team, and the drivers did not know their tanks. The 2nd Company had only three tanks, also PzKw 3s. In addition, Battalion Headquarters had two command tanks. There was no third company. One very weak company of motorcyclists was attached, as well as two guns from an infantry cannon company.

(4) Course of Action

The battalion marched in the following order: 1st Company, Battalion Headquarters, 2nd Company, infantry cannon, motorcyclists. Some of the motorcyclists were mounted on the tanks of the 1st Company. At 1000, after taking over the new tanks, the 1st Company moved out without sending forward an advance platoon. The march was rather quiet. After moving about three miles, the head of the 1st Company reached the crest overlooking the river and saw the village with the bridge, lying in the valley below.

The leading vehicles drove straight toward the bridge at high speed, without halting to observe the terrain to their front and without giving an order or receiving one. The following tanks did the same, so that the company advanced at top speed along the road and over the crest with its entire flank exposed to the enemy. When the leading tanks, company commander, and platoon leader of the 1st Platoon were about 50 yards away, the bridge blew up. Entrenched on the opposite slope, the enemy opened fire with antitank and antiaircraft guns and artillery upon the village and the road where the company had halted. The company took cover behind the houses, each tank for itself.

By this time the rest of the battalion had reached the crest overlooking the valley and halted. The 2nd Company and the infantry guns deployed to fire on the enemy entrenched on the hill across the river, while the motorcyclists dismounted from the tanks and took cover. The commander of the motorcyclists was with the

battalion commander. Because the new tank crews did not know how to operate their radios, it was impossible for the battalion commander to regain control of the 1st Company and fight it as a unit. Proper coordination was absent; the new crew members did not know where they belonged. Thus the tanks of the 1st Company fought independently of each other.

Since a crossing was not possible without the bridge, the commander managed to recall the 1st Company. Under the protection of several rear tanks which opened fire one by one, each of the advanced tanks broke off separately. Three tanks of the 1st Company were knocked out in the action--two entirely and one which could be towed away. When the Russians saw that we had given up the attempt to cross, they contented themselves with harassing fire so that their own losses were fairly small.

(5) Lessons Learned

(a) When on the march, send out an advance platoon to guard against surprise, even though expecting only a weak enemy.

(b) When approaching a sector which is probably occupied, halt and reconnoiter the terrain.

(c) If it is expected to capture a bridge by advancing at full speed, then place at least some elements in the reverse-slope position to provide fire support. Do not rush into the valley with all forces, because in so doing the units may run into a trap.

(d) No attack should be made with tanks which have just been taken over from another unit. The crews do not know each other, the drivers do not know the tanks; an otherwise good company is thrown into confusion.

(e) If an attack is to be made across a stream, engineers should be on hand to build a bridge if necessary.

b. Second Example

(1) Situation

With a strong combat group the enemy had taken up a position astride the two roads leading to Armawir in the region of Dondu Kowskaja on the Laba River and had cut off and encircled a German infantry battalion.

(2) Mission

The 9th Company of the 10th Tank Regiment was assigned the mission of rescuing the infantry battalion, and capturing the bridge across the Laba.

(3) Development of Action

(a) Taking the Bridge

The 9th Company advanced on Dondu Kowskaja from the direction of Maikop. Shortly before reaching the bridge leaning over the Laba, it was learned that it had already been occupied by enemy antitank guns and riflemen. The 2d Platoon was immediately ordered to go into position to the right of the road in the wooded sector and to bring the bridge under fire. After the 2d Platoon had taken position, the rest of the company advanced toward the bridge at full speed and took possession of it.

The 2d Platoon was then ordered forward with one tank left at the bridge for security.

(b) Taking the Village

Communications were established with the commander of the friendly infantry battalion that was surrounded. Some of the German infantry had managed to extricate itself, and it was attached to the tank company. The tank company commander divided his force into two groups and ordered them to advance through the village in two wedge formations; the two wedges were to close in a pincers movement upon reaching the northern edge of the village. The attached infantry advanced to the right and left of the tanks with the mission of protecting the flanks and of reporting any antitank guns or rifles. The attack was successful.

(4) Lessons Learned

(a) In attacks on bridge crossings fire support should be provided and the bridge crossed at high speed to form a bridgehead.

(b) In local fighting the cooperation between tanks and riflemen must be very close. The riflemen must immediately call out to the tank crews any target and enemy movements that they see, or they must destroy them with their own weapons.

c. Conclusions

If hostile forces have had appreciable time to organize the defense of a bridge, a tank attack to capture the bridge is not likely to be successful. In the second example this was not the case; hence, the complete success. It is doubtful, however, whether success could have been achieved in the first example. In that case the enemy was entrenched on the other side of the bridge, and in considerable strength, particularly in armor-piercing weapons. The bridge was blown up by the enemy even though the leading tank platoon advanced against it at high speed.

In the first example, if the leading company had acted as did the company in the second example, it would have given the battalion commander an opportunity to reach a proper decision; as it was, he lost control of his unit.

The following mistakes were made in the first example:

(1) An advance should not be made until signal communications have been established, particularly where a unit receives replacements the same day it goes into action.

(2) On the march, security must be maintained, which was not done in this case.

(3) In open terrain, motorcyclists or armored infantry should not ride the leading tanks. In the case described, the motorcycle unit was scattered when the leading tanks ran into opposition; control of the unit was lost. In wooded country, where tanks are tied to the roads and trails through the woods, infantry may ride the leading tanks. When the leading tanks encounter the enemy, the tank "grenadiers" get off at once and fight on foot.

The situation in the first example should have been handled as follows:

(1) Before the attack, the 1st Company should have placed a platoon in a position from which it could fire on the bridge; then a second platoon should have rushed the bridge as was done in the second example.

(2) In any event, the enemy undoubtedly would have succeeded in blowing the bridge in time. The battalion commander would then have had to use his entire force for a coordinated attack. This means that the infantry guns would have had to take up firing positions, as well as most of the tanks.

(3) The next step would have been an assault by the motorcycle company.

(4) The destruction of the bridge would not necessarily have prevented the accomplishment of the mission if there had been another intact crossing in the neighborhood. Then the battalion commander would have attempted a crossing at the latter place. If no crossing were available, a bridgehead would have had to be established. The armored division would then send up engineer and infantry reinforcements to enlarge this bridgehead.

ARTILLERY

5. RUSSIAN ARTILLERY COUNTER-PREPARATION

The publicity which dive-bombing has received in the present war has led some to declare that "land artillery" has been superseded by the "artillery of the air". The importance which the Russians attach to artillery is indicated in the following excerpts from a translated Russian article.

*　　　　*　　　　*

Experience has shown that repulsing the first large scale enemy attack is repulsing the offensive in general. Counter-preparation is perhaps the decisive factor in disrupting the opponent's attack.

In preparing to repulse the German offensive on the Orel-Kursk sector, we were fully convinced that the artillery in the counter-preparation would first and foremost neutralize the enemy artillery and mortars. Certainly, troop concentrations, troop headquarters, and road-junctions should also be kept under fire. However, these problems were considered as supplemental problems. It was necessary to take into consideration the fact that in the event our artillery thoroughly neutralized the German artillery and mortars, the enemy infantry and tanks would be without fire support, and his attack would be greatly weakened. In accordance with this project, a plan of artillery counter-preparation was drawn up in the artillery units long before the beginning of the engagement. This plan was distributed to the battery commanders who prepared details pertaining to their sectors.

The positions of the enemy's artillery and mortars were placed on each battery commander's map. The commander knew that at a definite signal his battery was to fire at a specific target for a given length of time, with a definite number of rounds.

It stands to reason that this plan was flexible and that it was modified according to our knowledge of the disposition of the enemy installations. Particular care, for instance, was taken in the evaluation of the opponent's firing positions in order to distinguish between main, secondary and dummy positions.

It is not enough to prepare a detailed plan for artillery counter-preparation; it is necessary to determine the exact time of commencement. The artillery counter-preparation that is too early or too late will not give the desired effect. The commander must have exact information as to the beginning of the enemy offensive. On the Orel-Kursk sector the time was determined on the basis of reconnaissance data, confirmed by examination of prisoners of war. Based on this information the signal was given for the artillery counter-preparation.

The order in which the firing was to be carried out was as follows: To begin with, all the guns fired a five-minute preparation on the enemy batteries. The target, rate of fire and number of rounds was definitely agreed upon before hand. Immediately following this a twenty-minute concentration was placed on the same objective by a considerable part of the artillery. Finally, another five-minute concentration was fired. During this period fire was placed on assemblies of enemy infantry and tanks. Our bombers raided the enemy headquarters, communication centers and tanks. The result was that a large number of artillery batteries and observation posts were neutralized. This, of course, was reflected in the German artillery-preparation; it was light and disorganized. The activity of those German batteries which had not been destroyed was disrupted.

Despite large forces of tanks and planes, the latter of which operated against our front line in groups of 10 to 15 the Germans were unable to pierce our front,

[redacted]

because their artillery at the very beginning of the offensive had been neutralized and was unable to support the attacking troops.

As practice shows, it is chiefly artillery that disorganizes the defending system of fire. Because of our artillery counter-preparation, the Germans were unable in any way to disrupt our system of fire and the defenders confidently met the enemy tank and infantry. Once more it was confirmed that a fortified zone can never be breached with success with weak artillery, despite the fact that large concentrations of tanks and planes take part. Therefore, the primary object of the defending force during the first period of the battle is the neutralizing of the enemy's artillery.

The effectiveness of the artillery counter-preparation depends primarily upon how well the reconnaissance of the opponent's artillery has been carried out. On the Orel-Kursk sector our reconnaissance succeeded in correctly determining the dispositions of the enemy artillery and relaying the information in time. This gave the opportunity of modifying the plan of artillery counter-preparation so that it was most effective when finally carried out.

This successful artillery counter-preparation, compelled the enemy to modify his tactics to his disadvantage. Thus, since the German artillery and mortars had been neutralized early and thoroughly they were forced to use their bomber planes as a substitute for artillery preparation. This reduced the activity of the German air force in our rear and allowed us to maneuver with more success.

In this example we have observed the artillery counter-preparation carried out on a large scale. Small-scale or individual counter-preparation is organized if the opponent is preparing to carry on active operations on a narrow sector of the front or if the enemy counterattacks after our troops have captured certain positions. Naturally, reconnaissance is a determining factor in such a situation.

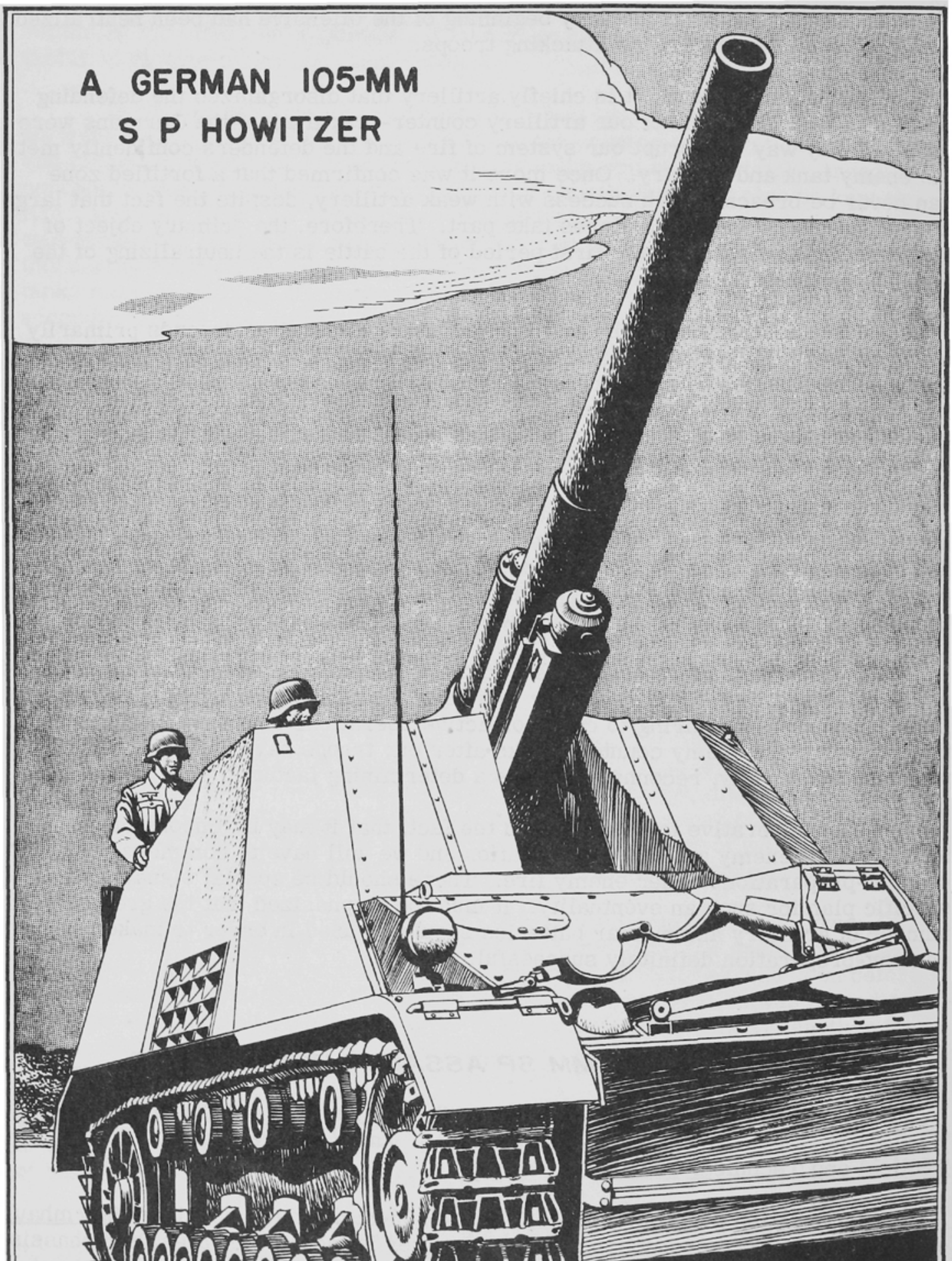
It is imperative to keep in mind the fact, that it may be impossible to anticipate the enemy artillery-preparation and we will have to commence our counter-preparations under enemy fire. There should be special signals and a specific plan for such an eventuality. It must be emphasized that the greatest number of artillery and mortar batteries should be used in order to make the counter-preparation definitely successful.

6. GERMAN 105-MM SP ASSAULT HOWITZER 42

The German 105-mm gun was described in Tactical and Technical Trends No. 12, page 12, and the 105-mm howitzers "18" and "42" were described in Tactical and Technical Trends No. 30, page 9.

Information pertaining to the German 105-mm assault howitzer (Sturmhaubitze) 42 has recently become available. This howitzer is mounted on a PzKw 3 chassis and is electrically fired. Unless the muzzle brake is attached, the gun must not

[redacted]



A GERMAN 105-MM
S P HOWITZER

be fired. Additional descriptive data follow.

Length in calibers	28
Length of barrel	9.55 ft
Length of barrel with muzzle brake	10.8 ft
Bore from breech to muzzle	8.79 ft
Maximum range	13,480 yds
Elevation	20°
Depression	6°
Width including PzKw 3 chassis	9 ft 8 1/2 in
Height including PzKw 3 chassis	6 ft 5 in
Length including PzKw 3 chassis	17 ft 8 3/4 in
Weight	21 1/2 tons
Muzzle velocity	1,771f/s

7. CLASSIFICATION OF GERMAN ARTILLERY

It has been reported from a British source that the Germans have made the following changes in nomenclature as applied to artillery classification.

New Term	Old Term	Translation
Leichte	Leichte	Light
Mittlere	Schwere	Medium
Schwere	Schwerste	Heavy
Schwerste	Üeberschwere	Superheavy

CHEMICAL WARFARE

8. GERMAN GLASS SMOKE GRENADES

A description has recently become available of two German frangible glass smoke grenades, Blendkorper (smoke screen grenade) 1 H and 2 H.

a. Blendkorper 1 H

This munition consists of a tear-drop shaped flask, 6 inches long with a maximum diameter of 2-1/2 inches, sealed at the upper end by drawing out the flask. The sealed tip is protected by a cardboard sleeve, sealed with a plaster of Paris type material. The flask weighs 13.2 ounces with 10.6 ounces of amber-colored titanium tetrachloride, (FM).

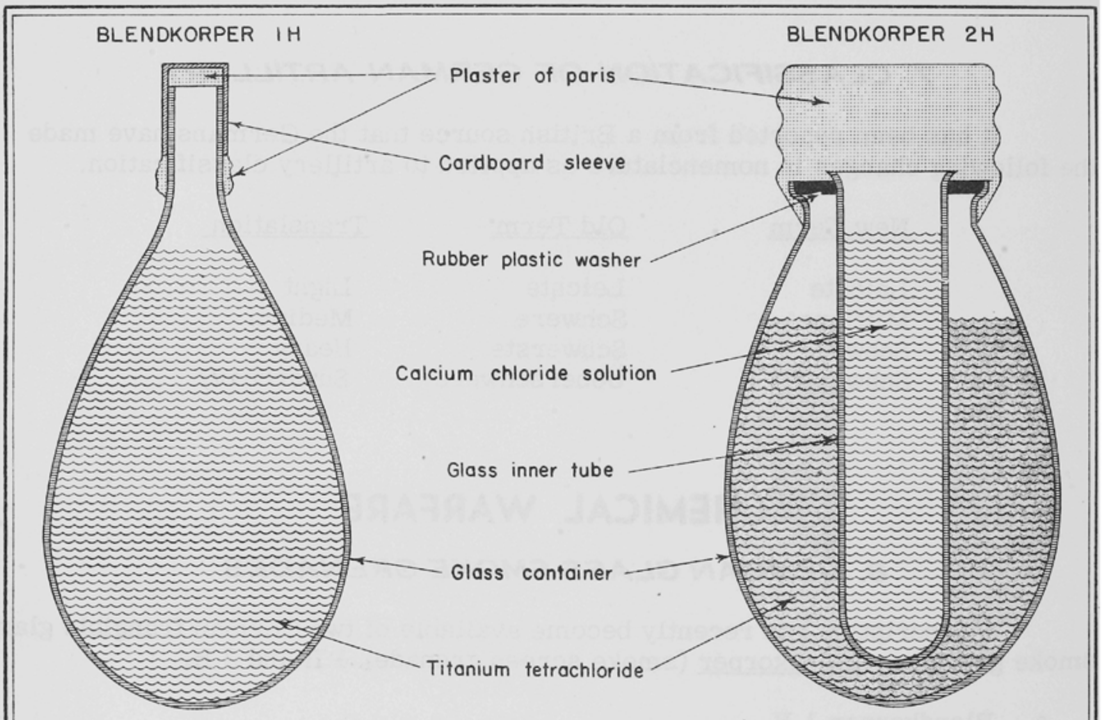
The munition is used by throwing against a hard surface which breaks the flask. The titanium tetrachloride then vaporizes, forming a smoke cloud which varies greatly with the relative humidity, being dense at a high humidity and thin at a low humidity.

[redacted]

The grenades are individually packed in a hexagonal, three-ply, corrugated paper container 6-1/2 inches long, by 3 inches square, wrapped in a transparent cellulose material. The top of the box has a handle which when pulled, removes the cover and flask. A label on the box gives in German the following directions:

Smoke Grenade 1 H
(<u>BK</u> <u>1 H</u>)
Directions for use.

1. For carrying, leave the smoke grenade in the cardboard box.
2. For throwing, remove the smoke grenade from the box;
   draw out the cover with the smoke grenade hanging in the band;
   take the smoke grenade in the throwing hand and remove the cover.
3. Throw the smoke grenade with force at the target, peephole, sights, etc.



GERMAN SMOKE GRENADES

b. <u>Blendkörper 2 H</u>

<u>The grenade</u> consists of a pear-shaped, glass outer flask, resembling a large electric light bulb, almost filled with a brown liquid. Inside is a long tube filled with a clear liquid; both are capped with a sulphur and plaster of Paris cement.

The total weight is slightly over seven ounces.*

The outer flask is a pear-shaped glass bulb, 2-1/2 inches in diameter at the widest point, 3-15/16 inches in height to the neck, where it flares out 1/8 inch and forms a collar approximately 1 inch in height and 1-1/2 inch in diameter. This flask contains 8.75 ounces of titanium tetrachloride.

The inner glass tube is 3 7/8 inches long and 7/8 inch in diameter, resembling a test tube with the upper end sealed off; the weight is a little under an ounce. The upper end has a slight shoulder which rests on a rubber-like plastic washer; this washer in turn rests on the inside shoulder of the collar of the outer flask; thus, when the cementing material was poured, the inner tube was firmly sealed within the neck of the outer flask. The inner tube contains about 1.2 ounce of a 27 per cent solution of calcium chloride.

The smoke is produced by hydrolysis of titanium tetrachloride. The purpose of the inner tube of calcium chloride solution is to provide water to react with the titanium tetrachloride and produce an instantaneous smoke cloud in the desert or in cold areas, where the low humidity would cause a slow reaction. The calcium chloride is probably added to keep the water from freezing.

This grenade was received in a cardboard box, 6-1/4 inches high, 3-3/4 inches wide, and 12-1/2 inches long, with separate compartments for each grenade; capacity four grenades. A label on the front of the box gave in German the following directions for use:

4 Screening Devices - 2H
(BK 2H)
Useable and freeze-proof to -40°C**

1. Carrying:
   Leave the Blendkörper in the closed carton.
2. Taking Out:
   Tear where indicated around the top at 1. Lift up the top, and tear out the Blendkörper. Take Blendkörper 2, 3, and 4 in the same way.
3. Throwing:
   Grasp the Blendkörper in the hollow of the hand, the round part toward the index finger. Throw with force at the target.

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*Apparently, this is the weight of the container. The total of all weights given is approximately 22 ounces.

**Equivalent to 40 degrees below zero, Fahrenheit - the only point at which the two scales coincide.

[redacted]

ENGINEERS

9. ENGINEER PRACTICES IN WINTER

a. General

A German engineering training manual contains the following account of the preparation of obstacles, minefields and demolitions under winter conditions. The depths of snow in which mines become unreliable is of particular interest in view of the number of unverified reports that mines will detonate when deeply buried. The load distribution (i.e., the spreading out of the load over a greater area as the depth below the surface increases) through snow from wheeled and in particular, semi-tracked vehicles is, no doubt, appreciable. There must, therefore be a limiting depth at which a given mine may be set and still function under the desired surface load.

Thus far, there has been no evidence of electrified fences on the Russian front, but there have been unconfirmed reports of their use in western Europe.

The possibility of erecting obstacles is greatly affected by winter conditions. Deep snow forms in itself a natural obstacle; it hinders troop movements on roads and across country. Under conditions of deep snow, movement is in general limited to roads and paths which have been previously tracked, or from which the snow has been removed. For this reason particular significance is attached to obstacles on roads. Tank movements are delayed by deep snow. According to present experience, tanks can force a passage through snow up to a depth of two feet; but snow considerably reduces their capacity for climbing.

b. Natural Obstacles

Natural obstacles in winter are considerably more effective than under normal conditions. Frozen rivers can be transformed into obstacles by demolition of the ice-covering.* As obstacles they will remain effective for a length of time depending on the rate of flow and on the temperature, also on the possibility of keeping them open in the face of enemy action. Slowly moving rivers and lakes cannot be kept open. The method of demolishing the ice-cover is to blow holes in it; through these holes the main demolition charges are placed under the ice by means of poles. The effectiveness of steep banks and excavations as good antitank obstacles is increased by deep snow.

c. Artificial Obstacles

The following are artificial obstacles: wire fences, wire snares, trip wires and barbed wire rolls.

(1) Wire Obstacles

(a) Erection in frozen ground. In frozen ground iron pickets, which can be hammered in, are more practicable than wooden pickets. Sockets for pickets

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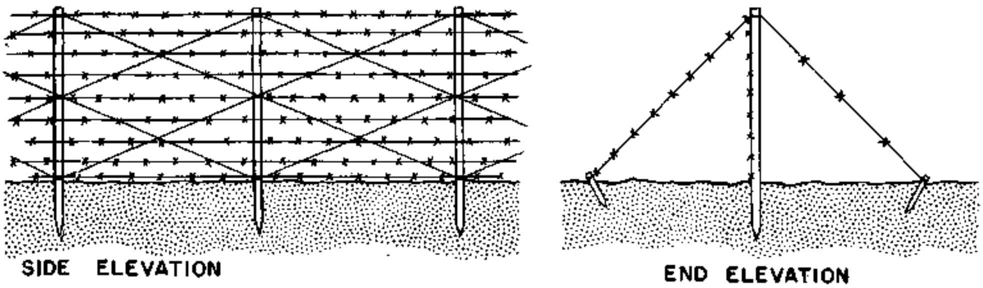
*See Tactical and Technical Trends, No. 21, page 8.



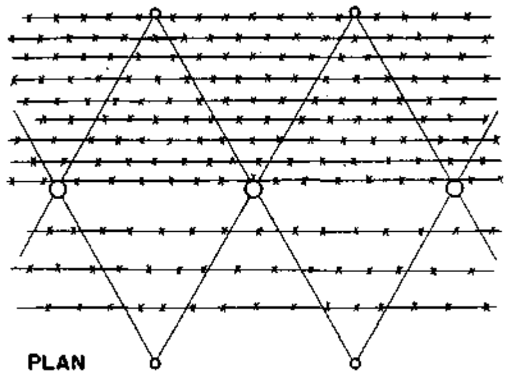


FIG. 1

HIGH WIRE FENCE FOR USE IN DEEP SNOW

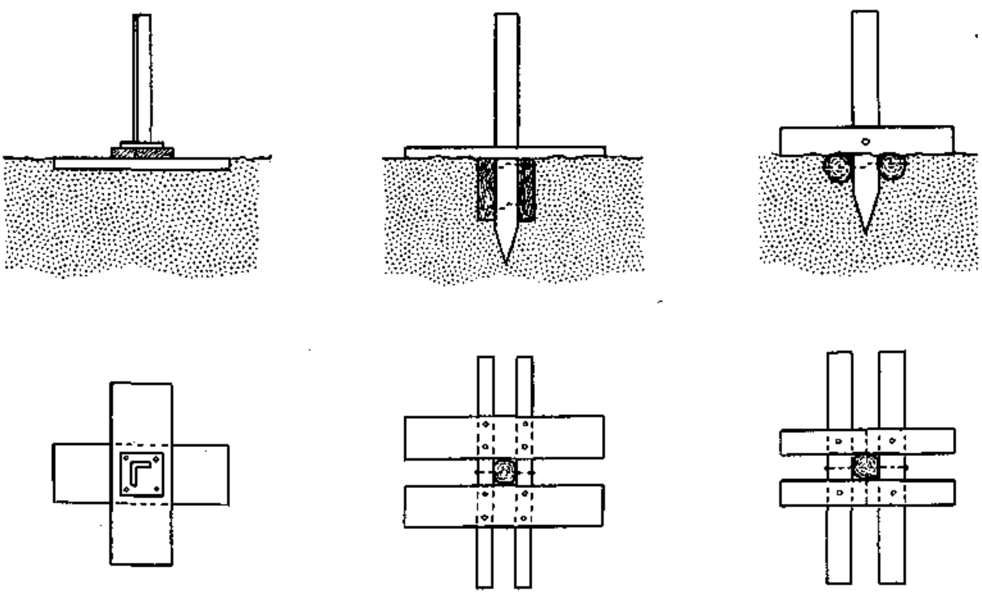
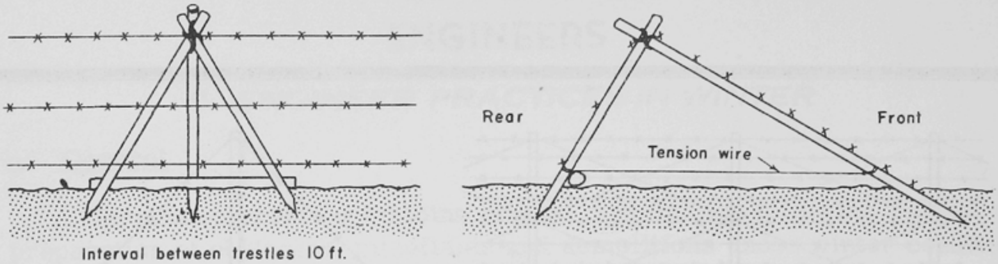


FIG. 2 ERECTION OF STEEL AND TIMBER PICKETS ON FROZEN SNOW



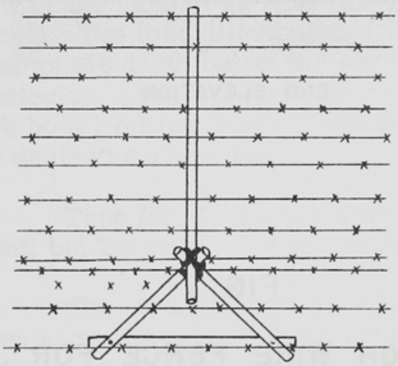


FIG. 3

TRESTLE BARBED WIRE OBSTACLE, ON SNOW

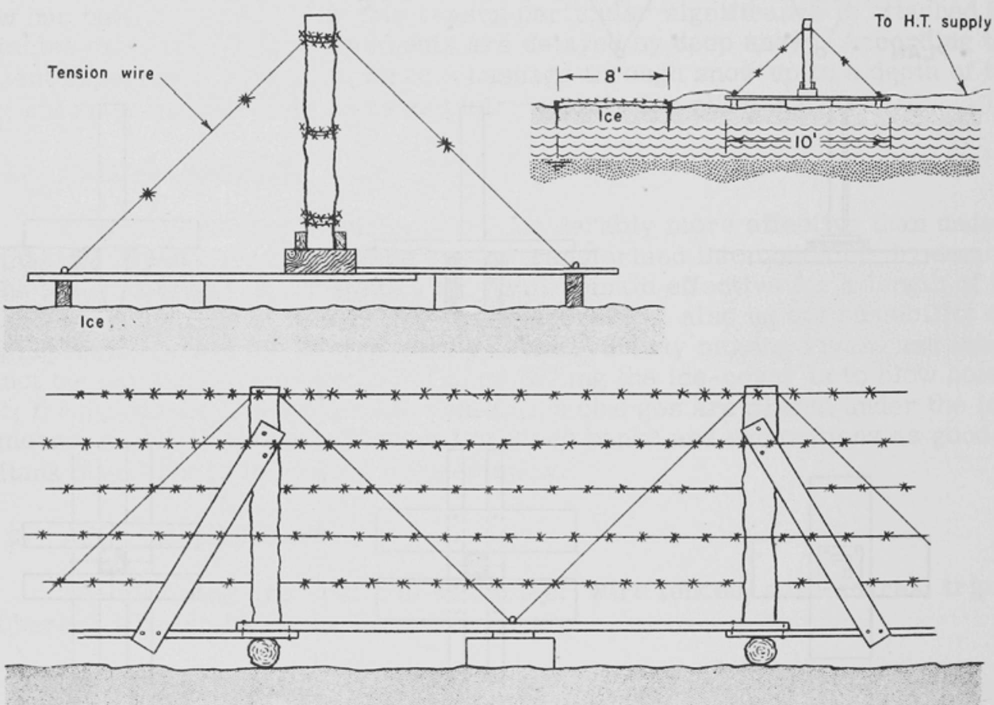


FIG. 4

ELECTRIFIED DOUBLE-APRON FENCE, ON ICE

[redacted]

can be prepared by engineers using power drilling equipment and demolition charges.

(b) Erection of wire obstacles in anticipation of deep snow. If deep snow conditions are to be expected, specially long pickets must be used in erecting wire obstacles. Wire can easily be set at the necessary height in woods and forests by attaching it to trees. If time is lacking, or there is uncertainty as to whether snowfall will occur, the upper strands of wire can if conditions permit be added later. A specially raised wire fence is illustrated in figure 1.

(c) Erection of wire obstacles on frozen snow. On a frozen snow surface pickets can be erected with the aid of heavy nails and cross-timbers, as shown in figure 2. Another method of erecting an obstacle on snow is shown in figure 3. Obstacles erected on snow have the disadvantage that under certain conditions they may easily sink.

(d) Simple warning devices, in the form of empty tin cans containing small stones or nails should be attached to all wire obstacles.

(e) Wire obstacles must be provided, on the side facing the enemy, with chevaux-de-trise, or rolls of plain or barbed wire.

(f) Construction of electrified wire obstacles on ice. Electrified wire obstacles can only be erected on ice by specially trained personnel. Simple wire fence, rolls of plain or barbed wire and multiple-fence obstacles in the form of several single fences, can all be constructed. Owing to the non-conducting properties of ice, a length of wire netting, eight feet in width, must be laid as a ground one foot in front of the electrified obstacle, and must be well connected to the ice by iron pickets every 30 feet. If possible, the ground should be carried right through to the river bed. Its effect can be increased by heavy snowfall. The obstacle is assembled as shown in figure 4, and erected on the ice.

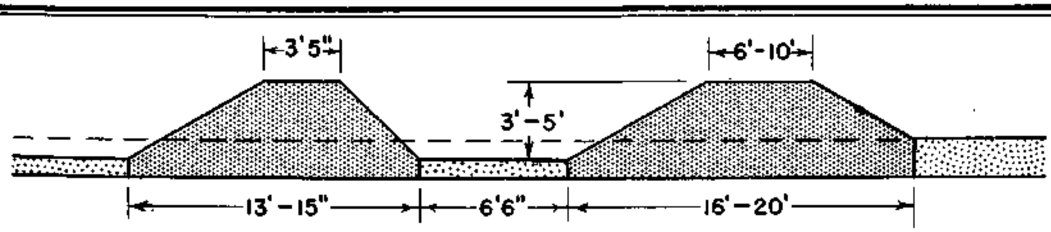


FIG. 5 SNOW ANTI-TANK WALLS

(2) Antitank Obstacles

(a) Snow as an obstacle. A continuous snow cover more than 2 feet deep forms a good obstacle against attack by tanks. The exact depth of snow which forms a complete obstacle to attack by tanks is not yet known, and snow should never be completely relied upon as an antitank obstacle.

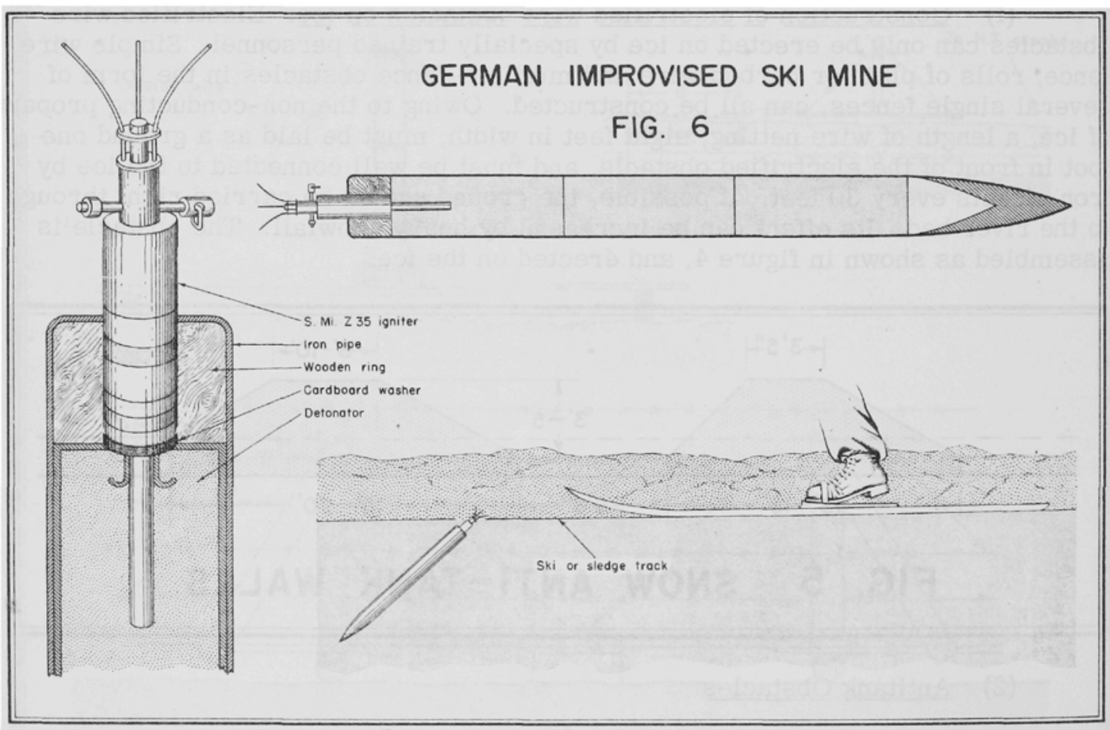
[redacted]

(b) Construction of snow walls. An effective antitank obstacle is provided by two snow walls built one behind the other, as shown in figure 5. The snow should be lightly tamped down.

(c) Artificial formation of ice. Roads can be made difficult of passage for enemy vehicles, armored cars, etc., by artificial icing. This is specially effective on steep gradients and slopes. Construction of snow walls in combination with the stretch that has been iced increases the effectiveness of the antitank obstacle. Ice-concrete obstacles, can be made -- see Tactical and Technical Trends No. 22 page 20.

(3) Minefields

The laying of minefields depends on snow conditions. Under a snow layer of one foot or more, Tellermines are no longer certain of detonation. S-mines (jumping mines) which have already been laid remain effective through frost and thaw, but are not certain of functioning under a depth of snow of four inches or more. Increasing depth of snow diminishes the capacity for detonation, and at a depth of 10 inches detonation will no longer take place. Mines of any type which have been frozen in should not be lifted, but must be demolished.



GERMAN IMPROVISED SKI MINE
FIG. 6

In the mining of ski and sledge tracks, an improvised ski-mine can be used effectively. This mine is shown at figure 6.

The fewer shelters that are available the more successfully can booby traps be used in buildings.

d. Handling of Demolition Stores

German explosives are unaffected by cold, and retain their properties through all conditions of weather and storage. In general the following precautions should be observed: -

(1) Demolition stores should be kept dry in shelters, separated from each other on wooden supports, and protected from extreme variations in temperature.

(2) Safety fuze, 1930 pattern (Zeitzündschmur 30) must be protected against cold. Safety fuze which has been frozen should be gradually warmed before use, otherwise it is liable to break.

(3) Demolition stores must be examined at frequent intervals; if in bulk, they should not be opened, but the condition of the outer layers only should be tested.

10. FIRING LOAD, TELLERMINE NO. 2

Recent British tests show that the shear-pin of the spring-loaded striker of this mine (see Tactical and Technical Trends No. 28, p. 17) shears under a dead load of approximately 400 pounds. Allowing for an impact factor of 20 per cent of the dead load, a live load of 320 pounds would be required to fire the mine.

11. CLEARING UNEXPLODED BUFFERFLY BOMBS

The following instructions for the recognition and destruction of German SD 2 "butterfly bombs," (see Tactical and Technical Trends No. 34, p. 23) has been taken from an official German directive.

* * *

a. General

The SD 2 is a fragmentation bomb weighing 4.4 pounds, whose external shape and construction differ considerably from those of the bombs formerly used.

It must be expected that some will be duds, owing to their peculiar characteristics. Duds usually detonate on the slightest movement and may therefore be dangerous to our own troops. They should be removed as soon as discovered.

[redacted]

b. Recognition

The armed SD 2 consists of a cylindrical iron body 3.15 inches long and 3.15 inches in diameter, which may be painted gray-green or black, or sometimes red, or may be unpainted. A wire cord 5.9 inches long projects from its body. There is attached to the free end of this cord a sheet-metal flap consisting of two saucer-shaped half cylinders fastened together by means of a hinge. Two smaller plate-shaped flaps are attached to this hinge, and extend to the left and right from the hinge and the saucer-shaped flaps, in an approximately horizontal direction.

SD 2 bombs which have fallen onto hard ground without exploding will, as has previously been described, be visible. Owing to their peculiar shape and construction they can easily be recognized. In order that duds may be more easily recognized, they will in the future be provided with bodies painted gray with yellow stripes .08 inch wide; which are:

(1) Parallel to the longitudinal axis on both sides of the fuze, and

(2) Painted on the nose of the bomb at an angle of 90 degrees with the foregoing stripes.

The whole surface of newly manufactured SD 2 bombs is painted yellow.

The flaps are marked as follows:

(1) The saucer-shaped and plate-shaped flaps bear yellow stripes .08 inch wide;

(2) The plate-shaped flaps bear a red stripe running at right angles to the yellow stripe.

Newly manufactured flaps are painted yellow and the plate-shaped flaps bear a red stripe .08 inch wide.

If the wire cord is torn out, as seldom happens, the bomb and flap lie in different places. It is then necessary to be especially cautious. The flaps of SD 2 bombs <u>which have detonated are perforated by bomb fragments</u>. If flaps not so perforated are found, it is probable that the bomb to which they belong has not detonated. The ground must be searched for bombs or be roped off to prevent any one from crossing it.

c. Sensitivity of Duds

The bomb is armed during its fall by the twisting of a pin attached to the stem-like cord from the fuze. SD 2 bombs that have not exploded are extremely sensitive. The slightest change in their position may detonate them, as the fuze is provided with a firing-pin system inside the body of the bomb, which is released by the slightest concussion. Even duds that have long been exposed to the weather retain this sensitivity. Owing to the very great fragmentation effect of the SD 2,

[redacted]

any careless act may endanger the life of the person involved, or result in seriously wounding him. It is consequently strictly forbidden to touch a dud.

d. Destruction of Duds

(1) When the bomb lies on the surface of the ground, an effort should first be made to detonate the bomb by firing a rifle-shot at it; this is usually successful owing to the concussion thus caused. In employing this method, the rifleman must fire from a safe, covered position at a distance of at least 50 meters from the dud. If the bomb cannot be exploded by firing at it, it must be destroyed by a blasting charge. When placing the blasting charge in position, one must take care not to touch the body of the bomb. It will suffice to place the blasting charge in the immediate vicinity of the dud without placing it in direct contact with the latter.

(2) When the bomb has penetrated the ground a noose of cord or wire is placed loosely around the flap without touching it. The noose is then drawn tight by a man in a safely covered position and the body of the bomb is pulled out of the ground. If it does not detonate, it must be destroyed in accordance with the instructions given under d (1).

Only artificers and personnel familiar with these instructions may destroy or remove SD 2 duds.

12. NEUTRALIZING TELLERMINE IGNITERS

In recent reports from engineers of the British Eighth Army, it is recommended that in all operational lifting of Tellermines the main igniter shall not be taken out of the mine, but instead, the slot shall be turned to Sicher (safe) and the safety bolt then pushed home. The igniter should be removed only when resistance is encountered in both of these actions.

This recommendation is based on reliable evidence and demonstrations by German prisoners of war when employed to lift their own minefields.

INFANTRY

13. BRITISH STREET FIGHTING TACTICS

The latest tactics and technique used by the British in training for combat in villages and towns indicate a rather definite consolidation of the lessons learned in the present war. Much of the procedure which is at present practiced throughout the United Kingdom is based upon intelligence coming out of Germany and Russia. Experience gained from these sources coupled with lessons learned in North Africa, should provide useful lessons for street fighting procedure.

[redacted]

In a general way, basis of present British instruction in this subject is movement covered by fire, for the most part irrespective of the apparent cover offered by buildings or other town construction. The theory of attack, which contemplates the thorough cleaning out of a particular area in a defended town, presupposes that none of the enemy can be expected to withdraw until he is driven out by the force of infantry arms. Such a theory is analogous to methods used by American troops in cleaning out areas infested by Japanese on Guadalcanal. It can be seen that the burden of the attack lies with the junior commander. Even the platoon leader is often required to make his own plans and decide upon his own sub-objectives entirely separate from those of the company commander.

The British infantryman uses a face net or veil made in a manner similar to the helmet net worn by United States troops. However, the face veil of the British soldier is sufficiently large to cover the helmet, the face and part of the shoulders. The mesh is somewhat finer than that of the helmet net. It is not attached to the helmet, but is removable and can easily be folded and carried in a pocket of the uniform. Such a veil assists in breaking the facial outline which is so easily distinguishable, especially when the wearer stands in front of a window or exposes his head above a regular skyline.

The British teach individuals who are fighting from the inside of buildings to stand back from an open window, even though this may narrow the field of fire considerably. The theory is that fighting within a town or city does not require the broader field of fire usually necessary in open country.

Where an automatic weapon is mounted to fire from within a building, a special preparation is required to prevent dust from rising from the improvised base. One method used is to spread a carpet over the base, or some other piece of compact flexible material, before setting up the weapon. A second method envisages the setting up of the tripod, followed by a thorough wetting of the surface on which the tripod rests.

When crossing streets which may be covered by enemy fire, a platoon leader requires his unit to move by squad rushes across the open area rather than to go individually. The thought here is to prevent enemy snipers from picking off members of a squad in rear of the first one or two who attempt the crossing.

The soldier is taught never to cross a street unless it is necessary for him to do so. Progress along the street should be from door to door, and at the double, keeping as near the wall as possible. In this instance, progress should be made by individuals and not by groups, since sufficient cover for only one or two men in each doorway can be expected. Should a man be hit and fall, members of his squad are instructed not to pause to effect a rescue, since the sniper causing the original casualty is almost certain to be in a position to kill anyone who pauses in the immediate vicinity.

While cleaning out the interior of large buildings, it is believed that the best procedure, where possible, is to proceed from top to bottom; it is easier to throw hand grenades downstairs or through holes made in floors of upper stories

[redacted]

than it is to attempt to throw them upstairs.

In most instances where a room is about to be entered, a hand grenade is first thrown into the room by opening the door, throwing in the grenade and closing the door quickly. The instant after the grenade has exploded, and while the results of the concussion from the explosion are still in effect, the clearing party rushes into the room with a light machine gun or rifle ready for action. The drill usually prescribes the movement from room to room or from floor to floor in two groups, evenly divided, the rear group covering the advance group by fire. For instance, at the foot of a stairway one or two men will cover the progress up the stairs of what might be called an advance searching party. After the advance group has arrived at the top of the stairs, the rear group then follows. When a room has been searched and found to be free of the enemy, the forward group calls out, "Clear". This is the signal for the covering group to enter the room. With the complete party assembled, the search is then continued from room to room and from floor to floor. The importance of searching a particularly well-defended building from top to bottom appears to be taken into special account. This naturally requires the progress from the roof top of one building to that of another. Once a particular building has been cleared, the searching party then returns to the roof, from which they move to the top of the next building, and so on.

In order to perfect this drill until it becomes a matter of second nature, the British have instituted a battle drill called Street Fighting. In this drill, a street of a town is established as a training ground and a complete infantry platoon runs the course described below:

(1) The platoon divides itself into its three sections (U.S. Squads) in such a way that one section may cover the right-hand series of buildings, while another takes care of those on the left-hand side. The third section splits itself into two groups in order to cover the rear of each series of buildings which form the street. This latter section remains in firing position in the rear of the buildings until a considerable portion of the street has been cleared by the first two sections. The supporting section then advances to positions from which it may cover the rear of the buildings farther along the street.

(2) As to the action of the two sections which clear the houses paralleling the street, the section on the right side moves forward a predetermined distance, covered by fire from the left section. After the right section has reached its sub-objective, it takes up a firing position which will permit it to cover the advance of left section up its side of the street. This maneuver is then continued along the street until the entire allotted area has been cleared, see sketch.

(3) As to the progress of the individual section in its movement up one side of the street, the rifle group normally goes first, covered by the Bren-gun group. After the rifle group has reached its sub-objective, it then covers the movement of the Bren-gun group while it rejoins the section. As was described above, the entire movement of this section (squad) is covered by the fire of the

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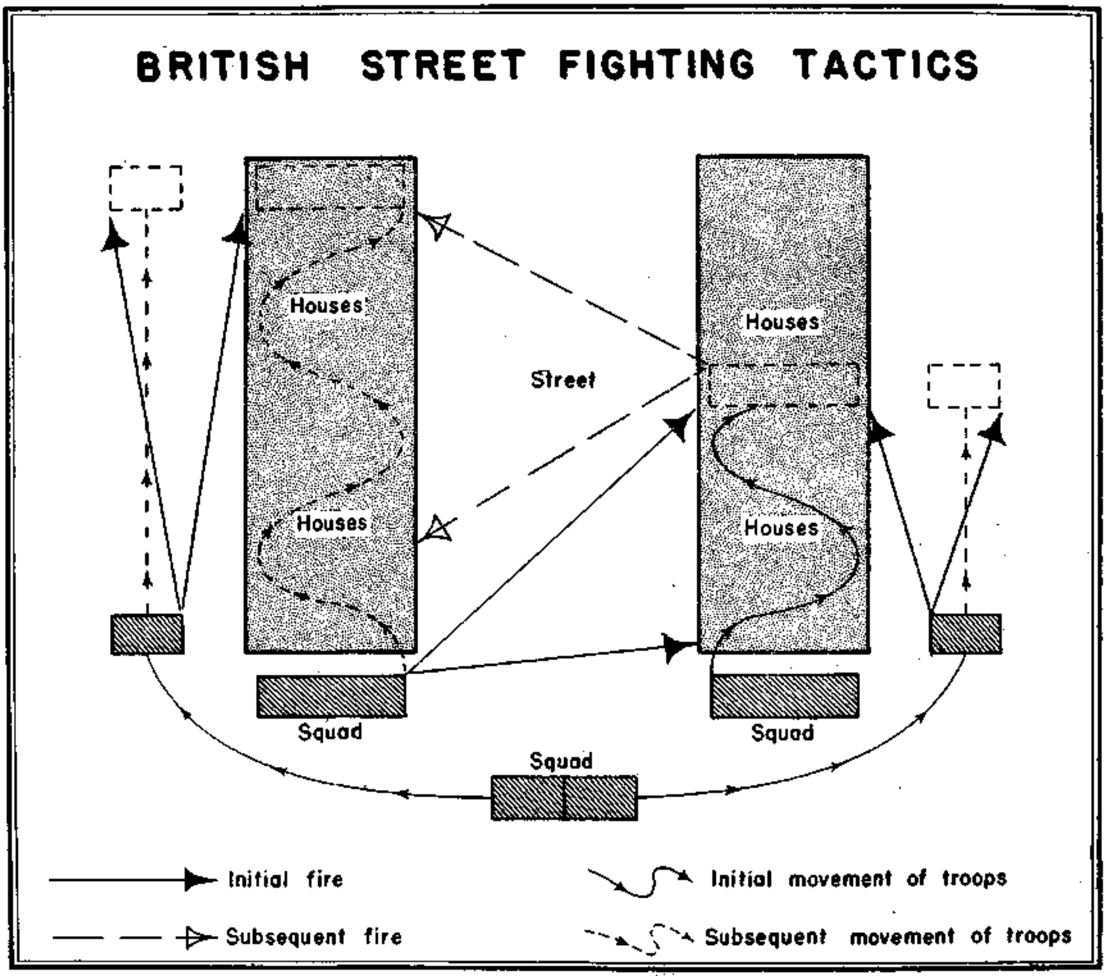
opposite section from an echeloned position.

In case the enemy fire is so intense and his resistance so stubborn as to



cause a definite pause in the progress of the platoon, the 2-inch mortar is brought into play, either for HE fire or for smoke-bomb screening purposes.

14. A GERMAN FIELD ORDER

A translation of the German field-order, "Order for the Operation Flieder-blüte" (lilac Blossom) covering an engagement in North Africa, shows a good example of German thought and care. It will be noted that while this German order has marked similarities to our own, it is much more detailed. The first two paragraphs

of the German order contain about the same amount of data that would normally be found in the same paragraphs of one of our attack orders, but instead of one instructions-paragraph with subparagraphs for each tactical unit, paragraph No. 3 of the German order merely gives the component units of the combat teams, and paragraphs 4 to 13 inclusive give the missions and boundaries of the tactical units.

ORDER

FOR THE OPERATION FLIEDERBLÜTE (LILAC BLOSSOM)

1. Enemy has withdrawn part of his forces from the right sector of the Hermann Goering Division and has disposed them in front of the 334th Infantry Division.

The reorganization of enemy forces facing our own sector, or their reinforcement by new units, is to be expected. The troops now in position will transmit information about infantry and artillery positions, as well as enemy mine fields, to the units participating in the attack.

2. Division Hermann Goering will destroy enemy forces southeast of MEDJEZ EL BAB, and enemy artillery in the area 202/49 - 45 - 56 - 63 - 59. It will engage enemy units on the right of our forces and pin them down.

In addition, the Division will capture in a night attack the chain of heights southwest of 202/49 including RAGOUBET EL HACHENE and the height near 202/66 to the road Z.P. (objective) 202/63 - 68.

3. Attacking Units

a. Battle Group (Kampfgruppe) Audorff with one grenadier battalion; one A A Battery; 1/3 Engineer Company.

b. Battle Group Schirmer with Parachute Regiment Hermann Goering; I and II Battalions Panzer Regiment 7; 1 company Panzer Pioneer Battalion, Hermann Goering; 2/3 of 4th (Antitank) Company Reconnaissance Unit Hermann Goering.

c. Battle Group Funck with parts of II Battalion Grenadier Regiment 1-Hermann Goering.

4. Missions

a. Battle Group Audorff will occupy the chain of heights southwest of 202/49 including RAGOUBET EL HACHENE; hold it along a line facing generally northwest, and block the road MEDJEZ EL BAB - GOUBELLAT against enemy tanks. Battle Group Audorff will assemble east of line 203/57-60 and attack on a line running generally from 202/47 - 203/68.

b. Battle Group Schirmer will destroy enemy artillery west of line 202/49-61, annihilate enemy forces on hill 202/66, defend itself, adjacent to Battle Group

[redacted]

Audorff on a general line 202/57-63 and on the high ground northeast of 202/68. Two subordinate units are to be formed for this operation:

Sub-unit North, consisting of:
One Jäger Battalion
11 Battalion Panzer Regiment 7
1/2 of 1 Company Panzer Pioneer Battalion Herman Goering
2/3 of Antitank Company Panzer Reconnaissance Battalion Hermann Goering

attacks from forward assembly area east of line 203/47-44 over objective 203/67 - 202/52.

Sub-unit South, consisting of:
One Jäger Battalion
1 Bn. Panzer Regiment 7
1/2 of 1 Company Panzer Pioneer Battalion Hermann Goering

attacks from forward assembly area east of line 203/65 - 223/11 over objective 223/01 - 222/09.

Battle Group Schirmer will maintain close contact with Battle Group Audorff if necessary, to support them in capturing the high ground southwest of 202/49.

Sufficient security will be provided against Lalla Manna.

c. Battle Group Funck will capture the heights along line running generally 222/27-18 and hold them to protect the left flank of Battle Group Schirmer. For this operation, Battle Group Funck will attack from the area it holds at the time across line 222/13-16 to the west and southwest.

5. Boundaries

a. Between Battle Group Audorff and Battle Group Schirmer 203/49-60 (to Audorff) - 202/53 (to Schirmer) - 52 (to Schirmer).

b. Between Battle Group Schirmer and Battle Group Funck 223/36-37-222/13-28.

6. Start of attack for a'l Battle Groups

X-1 day at 2300.
X day will probably be 21 April 1943.
X day will be announced definitely to the division by Major General Schmid, or the G-3 and is to be acknowledged by the Battle Group commander or adjutant.

[redacted]

7. Group of Heavy Weapons

Consisting of:
Two How batteries of 1/Pz. A.R.* 90
One battery of 88-mm AA guns
14th Co. Grenadier Regiment 1 Herman Goering

These will support sub-group "North" of the Battle Group Schirmer, and their assembly area will be 203/40-45-41.

Behind sub-group "South" of Battle Group Schirmer, will be one battery of heavy antiaircraft guns, in the area east of 223/01.

This whole group, under command of Capt. Bohme, will be kept in readiness to support on call from Division, the sub-groups of Battle Group Schirmer during the night of X day to X-1 day.

8. Unit "Hubert", consisting of two infantry companies of AA Regiment Hermann Goering will occupy during the night of X - 2 to X - 1 day, the main line of resistance in the sector 203/43 to 223/37, which at present is unoccupied.

The unit "Hubert" is subordinated to Jäger Regiment Hermann Goering, effective X - 2 day at 1200 and will be tactically under their command.

Mission: The positions of the MLR are to be defended against any tank attacks.

9. Motorcycle Battalion 10

The Battalion, only recently made available by 5 Panzer Army, will upon arrival, be attached to Regiment Audorff and will take over the present positions of Battle Group Audorff in the sector 203/71-58 on the evening of X - 1 day. Employment to be controlled through Regiment Audorff.

Mission: The positions of the MLR are to be defended against any tank attacks.

10. Artillery

Artillery Commander Hermann Goering will support with Artillery Group "North" and Artillery Group "Center", from their present assembly area, the Division attack. He will destroy, through coordinated fire, enemy artillery positions, emplacements, and assembly areas.

Closest coordination with the attacking troops is to be secured by assigning artillery liaison detachments to the battle groups, and forward observers to the

*Probably 1st Bn, 90th Artillery Regiment of the 10th Panzer Div.

[redacted]

attacking units. It is requested that the Army Artillery Commander support the Division attack with the artillery of Battle Group Audorff and the 170-mm cannon battery.

Missions:

a. For Artillery Group "North": Closest cooperation with Battle Group Schirmer, supporting their attack by destroying enemy artillery, pinning down their observation posts and shelling their positions and assembly areas.

The two light howitzer batteries designated for attachment to the heavy weapons group (Capt. Bohme), are to be kept in their positions, ready for action, as long as possible.

b. For Artillery Group "Center": To pin down the enemy in the area of 222/02 and support of Battle Funck; also by means of coordinated fire, to simulate an attack on 222/02 commencing X day, 0000 hours.

c. For Artillery of Battle Group Audorff: Support of Battle Group Audorff in closest cooperation with it.

d. For 170-mm Battery: Destruction of enemy artillery in the area south of MEDJEZ EL BAB, and the shelling of enemy observation posts and assembly areas in closest cooperation with Battle Groups Schirmer (main effort) and Audorff.

e. Special Order for the Artillery: Artillery will open fire only upon request of the battle groups, or of the observation posts attached to them, in order to insure the element of surprise.

11. Battle Plan

Based on the progress of the battle and enemy situation in general, the Division will decide on X day at 1900 hours, whether:

a. The positions gained are to be held and the heavy weapons group (Capt. Bohme) to be brought forward for this purpose into the newly-won area, reinforcing Battle Group Schirmer, or

b. Whether the mission to relieve the adjacent sector on the right, after having engaged the enemy forces there, can be considered as accomplished and the attacking units can be withdrawn to the old MLR during the night of X to X+1 Day.

The Division must, under any circumstances, avoid heavy losses in personnel and materiel.

12. Air Corps "Tunis" is requested to support the Division attack by keeping control of air over the attacking units and employing fighter-bombers to bomb known assembly areas, troop concentrations, and artillery positions; in addition, to keep surveillance over the enemy's lines of communication. The Air

[redacted]

Force liaison officer will be with Battle Group Schirmer at the start of the attack.

Particular attention is directed to Division memorandum of 15 April 1943, "Marking of Front Lines."

13. Antiaircraft Defense

With the consent of Artillery Commander Hermann Goering, the Antiaircraft Regiment Hermann Goering, with its light antiaricraft guns, will protect the artillery positions and the "heavy weapons" group.

14. Supplies

G-4 of Division Hermann Goering will secure transportation for the 50-mm antitank guns of Battle Groups Schirmer and Audorff, and fully supply the artillery in advance.

Details of the supply system will be arranged by G-4 in accordance with Special Orders.

15. Signal Communications

Division Communications Officer will set up and maintain wire and radio communication with the Grenadier Regiment, the Jäger Regiment Battle Group Audorff, the artillery commander, and the antiaricraft regiment.

Special instructions concerning signals communications will be issued separately.

16. Commander of Panzer Regiment 7 and Artillery Commander of Panzer Army 5 are requested to report to the Division CP at the start of the attack.

17. Complete secrecy of the operation Fliederblüte must be maintained, the use of ordered code names must be strictly observed. The Division forbids any troop displacements or increased vehicle traffic until the start of the attack.

18. Reports

All reports will be based on the 1:50,000 fire-control map. The attacking groups will report all noteworthy occurrences. In case of failure of signal communications, liaison officers will be dispatched.

19. Div. C.P.

Point 203/23 from X-1 day at 2200 hours.

20. I expect that all members of the Division Hermann Goering are aware of the importance of the operation Fliederblüte, and by means of their ability and moral strength, will inflict considerable damage on the British, thus contributing

to final victory in Tunisia.

I am convinced, that the men of the Army will share our determination and that parachutists and armored troops will fight in close cooperation as "comrades in arms".

MEDICAL

15. NOTES ON JAPANESE MEDICAL SERVICES

Information from Allied Headquarters in India indicates that the organization and general standard of Japanese medical services for the evacuation and treatment of casualties are similar to our own. The strict attention paid to precautions for the prevention of diseases likely to be contracted by troops in a theater of war shows that the Japanese do not overlook the damage which the incidence of such diseases can inflict on the morale and efficiency of an army in the field.

In addition to units of the army medical corps there are detachments of medical officers and men assigned to all regiments. These men are distributed so that there is a medical man with each platoon as well as a small medical section with the regiment. The duties of the platoon medical men include preliminary treatment of the wounded, in most cases amounting to the application of the first field dressing carried by every man, and the continuation of treatment of cases returned from hospital. It is also apparent that they are to insure that very strict prophylactic discipline is observed to counter epidemics and other avoidable diseases.

One medical orderly attached to a platoon in the Buna area, in addition to his personal belongings, carried an ordinary soldiers' knapsack containing the following:

Peptic tablets (for stomach trouble)
Aspirin tablets
Morphine solution
Tincture of iodine
Iodoform (an antiseptic)
Zinc oxide
Atabrin
Quinine sulphate
Benzoin
Knife, saw, etc., (to make a stretcher)
Adhesive plaster
Bandage
Gauze
Scissors
Thermometer
Boric acid
Rivanol solution (a disinfectant)
Syringe
Sodium bicarbonate
Absorbent cotton

In Burma malaria has been the greatest problem of the medical services. The Japanese have used mosquito nets large enough for a whole squad, antimosquito cream and spray being available for sentries and others who have to be outside

[redacted]

the net. Atabrin or quinine are also taken every day by all who have not had malaria. In spite of these precautions every man in one Japanese regiment had had malaria at least once.

Apart from malaria the Japanese have taken great care to prevent epidemics from impure drinking water. The platoon medical orderly is responsible for water hygiene and whenever the army medical authorities have not been able to lay in a supply of pure water, recourse is had to the water purification outfit (chlorinating vials) carried by every man.

In addition to anti-malaria and water precautions, pills are taken by every man however healthy, one type every ten days while five of another type containing vitamin B are taken every day, presumably to maintain general health.

Incidence of venereal disease which is low is kept to a minimum by the establishment of army organized houses, entrance to which involves first obtaining a medical certificate. However, no punishments are inflicted on those who become infected.

The Japanese are strict about inoculation and vaccination. Every time a patient is about to leave a hospital he is inoculated and battalions are inoculated en masse.

The most forward army medical unit for the treatment and evacuation of casualties is the advance dressing station of the divisional medical unit. There the patients are classified and their preliminary dressings checked. They are then evacuated by means of the ambulance company of the same unit to one of the division field hospitals. There is usually one of these with each first line regiment and they are equipped to perform reasonably extensive surgical treatment. From the division field hospitals patients are further evacuated to line of communication hospitals, reserve hospitals or base hospitals in the home areas or are released to rejoin their units. Evacuation is effected by combination of stretcher, horse-cart ambulance, motor ambulance, ambulance trains, river craft and by hospital ships.

16. GERMAN ANTI-LICE CLOTHING

From an official source comes a report that lice-killing underclothing is claimed to have been invented in Berlin. This said to be done by impregnating the clothes with a chemical substance, which by the warmth of the body develops fumes which fill all crevices in the clothing. These fumes kill the lice and keep fresh lice out. The new process is expected to be of great assistance for clothing on the Russian front. It is thought possible that the German purchase of laurel for conversion into lauric acid may provide the chemical substance alluded to, since it has been somewhat similarly used in Great Britain.

[redacted]

ORDNANCE

17. GERMAN RIFLE-GRENADE EQUIPMENT

The need of a high-angle weapon to fill the gap between the hand grenade and the small infantry mortar has revived the rifle grenade. In World War I, both the British and French developed rifle grenades; the British had a weapon mounted on a rod thrust down the rifle barrel and propelled by a blank cartridge; the French grenade was the "VB" of the American Expeditionary Forces. This grenade was a steel container, about the size and shape of an ordinary can of condensed milk, but pierced longitudinally with a dough-nut-like hole. When fired from a pint-size steel launcher called a "tromblon" which was fastened to the muzzle by a bayonet clip, the bullet of an ordinary ball cartridge passed through the hole in the grenade, arming it in passage, and the gases following the bullet hurled it, tumbling end over end, about 200 yards. The blast of the pound-and-a-half grenade was devastating, and a very fair measure of accuracy was obtainable with practice.

The Germans have two types of rifle grenade launchers -- one, a spigot-type launcher, similar to our own, and one, a cup-type launcher, of an entirely different sort. The cup-type launcher will fire three projectiles--an antipersonnel grenade, a light AP, and a heavy AP, both containing hollow-charges. The heavy grenade under favorable conditions will penetrate about two inches of armor, making it a rather effective antitank weapon at close quarters. Complete data is still lacking on the spigot hollow-charge grenade, but it would appear to be a powerful projectile

* * *

PART I

a. <u>Rifle Discharger, Cup Type (Schiessbecher)</u>

(1) The discharger (figure 1) is made of steel, and consists of a rifled barrel which screws into a holder fitted with a clamp for attaching to the rifle barrel. There are no gas ports, and varying ranges are obtained by altering the elevation of the rifle with the aid of a sighting attachment. With practice, however, the discharger can be used effectively without the sight.

(2) <u>Ammunition</u>

Three types of grenade (figures 2-4) are fired, two of which in different sizes are armor-piercing and the third is antipersonnel with provision for throwing as a hand grenade.

(a) <u>Small AP Grenade (Gewehr Panzergranate G. Pz Gr)</u>

This grenade (figure 2) incorporates the hollow charge principle, with a shaped cavity formed at the forward end of the HE filling with the result that, on impact, a jet of blast is concentrated in a forward direction. <u>It follows, therefore, that the penetration of armor is equal at all ranges, since it depends on this jet</u>

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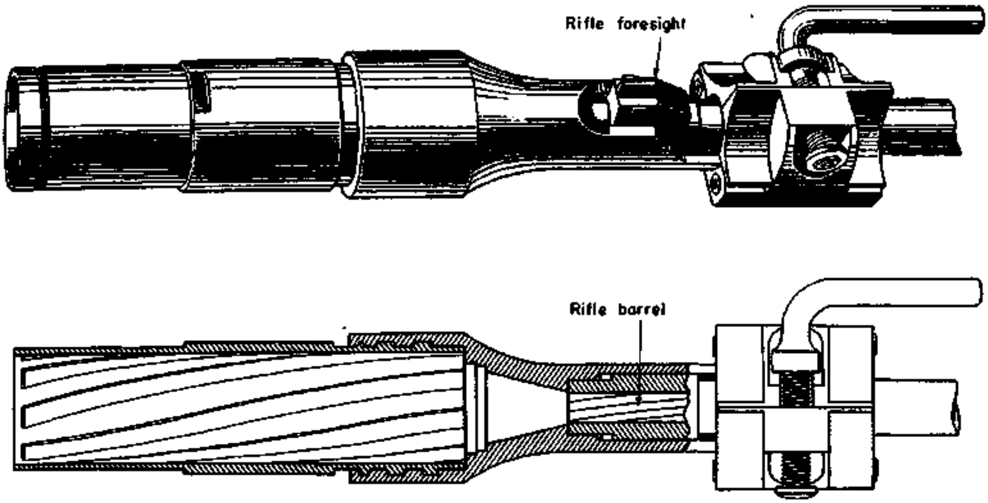


FIG. I RIFLE DISCHARGER (CUP TYPE)

SMALL AP GRENADE

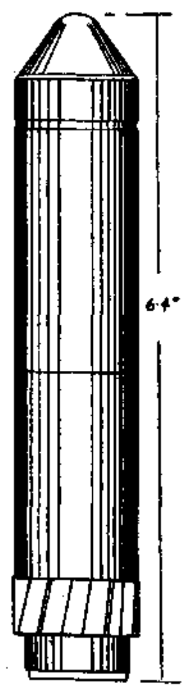


FIG 2.

LARGE AP GRENADE

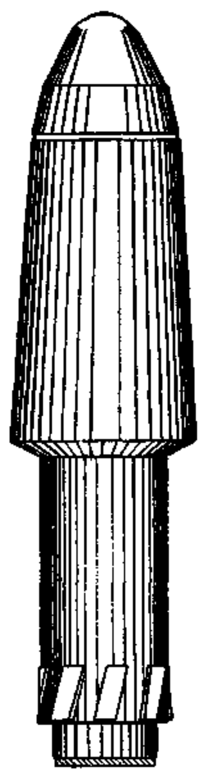


FIG. 3

ANTIPERSONNEL GRENADE

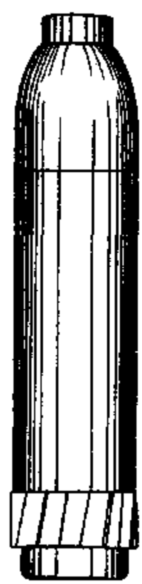


FIG. 4

and not on the striking velocity of the projectile. The difficulty of hitting the target, however, restricts the use of this grenade to ranges up to 100 yards. It is likely to be effective only against lightly armored targets.

The body is made in two parts -- a forward portion of steel containing the bursting charge and hollow-charge cone, closed by a light metal cap, and a rear portion of light aluminum alloy containing the fuze and detonator system. An exterior-rifled driving band is placed 6-mm (.236 in) from the rear end of the grenade. Other details are as follows:

Total weight	8.8 oz
Overall length	6.4 in
Weight of filling	1.75 oz

(b) Large AP Grenade (Gr. G. Pz Gr -- Gross Gewher Panzergrenate -- Large-weapon Panzer Grenade)

This grenade (figure 3) is constructed on similar general lines to the above, except that the front portion is enlarged and contains a greater bursting charge. The total weight of the grenade is approximately 12 3/4 ounces; the weight of the bursting charge 4 1/4 ounces. This grenade and the small AP grenade both should be handled with great care, as they arm very easily. Both of these grenades are fired by the German antitank rifle when especially modified for their use.

(c) Antipersonnel Rifle or Hand Grenade (G. Spgr Gewehr -- Sprenggranate)

The cylindrical steel body of the grenade contains the HE filling and detonator. It is screw-threaded at the nose to take the fuze-body and at the base to take the rifled base-attachment. When fired from the discharger, the grenade functions on impact, or after 11 seconds, by means of a self-destroying system should the fuze fail to function. When thrown by hand, the base-attachment is unscrewed and removed, giving access to a cord attached to a friction igniter. Immediately before throwing, the cord is pulled and the grenade detonates after 4 1/2 seconds delay. Other details are as follows: --

Overall length	5.5 in
Weight fuzed	9 oz
Weight of filling	1.1 oz
Maximum range	250 yds

(d) Propelling Cartridge

In the case of the small AP grenade and the antipersonnel grenade, the propelling charge is a standard 7.92-mm steel cartridge case closed at the mouth by crimping. For the large AP grenade the cartridge is provided with a wooden bullet. The grenades are packed singly in cartons with their appropriate cartridges.

(e) The sight (figure 5) is in two parts; a fixed portion consisting of a carrier-plate and clamping band, and a moveable portion comprising a sight arm

[redacted]

with rearsight, frontsight, and bubble level, and a range arc. The range arc has two scales; the upper, for low-angle fire, is graduated from 0 to 250 meters, and the lower, for high angle fire, from 50 to 250 meters (1 meter=1.1 yards approx).

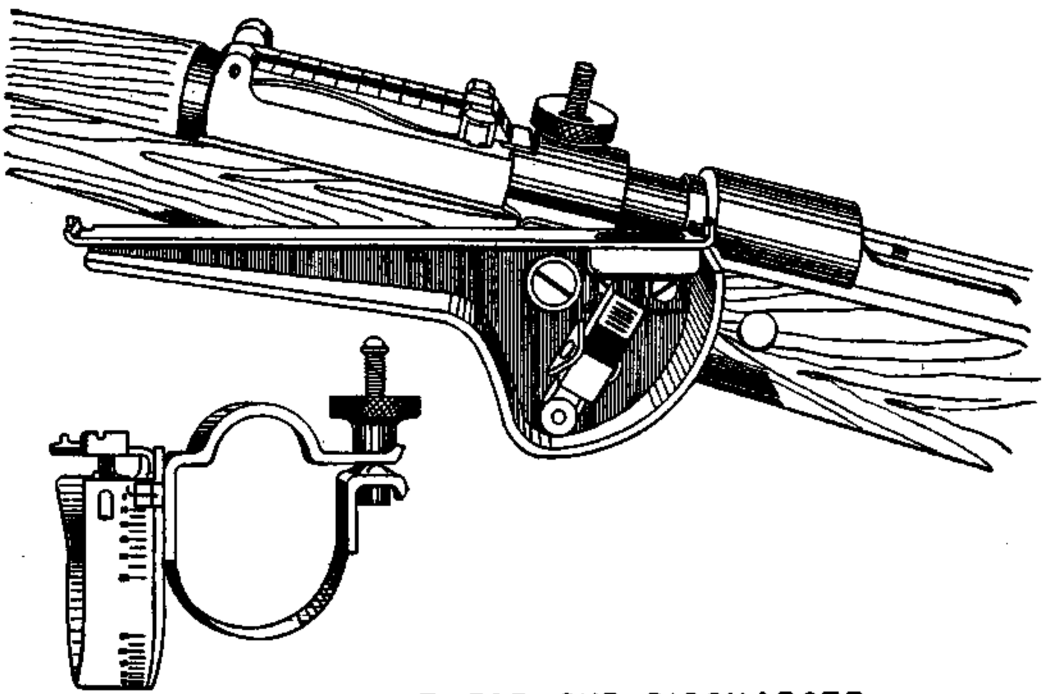


FIG. 5 SIGHT FOR CUP DISCHARGER

The sight is attached to the left side of the rifle by means of the clamping band, immediately to the rear of the rifle rearsight. The data on the range scale apply only to the antipersonnel grenade. For the two AP grenades the following corrections should be made: --

Small AP grenade

75 meter graduation corresponds to 100 meters (109 yards) required range.
50 meter graduation corresponds to 65 meters (75 yards) required range.

Large AP grenade

125 meter graduation corresponds to 100 meters (109 yards) required range.
100 meter graduation corresponds to 75 meters (82 yards) required range.

[redacted]

75 meter graduation corresponds to 50 meters (55 yards) required range.

PART II

a. Rifle Discharger, Spigot Type

(1) Discharger

The discharger consists of a hollow tubular spigot (see figures 6 - 7) of about one inch diameter terminating in a part resembling the hilt of a bayonet. Over this spigot fits the hollow tail-piece of the grenade. It is fitted to the rifle, in the same manner as a bayonet, over the bayonet standard and foresight block, and is locked in position by a spring-loaded bolt. On firing the propelling cartridge, the gasses pass out of the barrel of the rifle, through the spigot, and into the hollow tail-piece to propel the grenade.

(2) Sights

(a) A swing-over blade front sight is fitted to the left side of the base of the spigot.

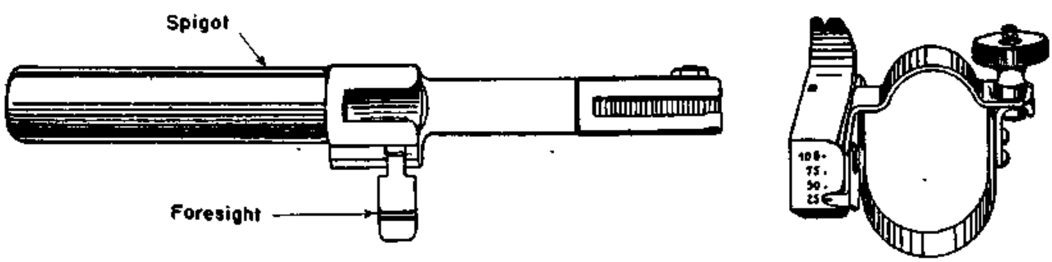


FIG. 6 RIFLE DISCHARGER (SPIGOT TYPE) AND SIGHT

(b) A rear sight attachment is fitted to the left side of the rifle by means of a metal strap and thumbscrew. The body, which is movably attached to the metal strap by means of a carrier-plate, is in the form of a metal box about five inches in length, on the forward end of which a V is formed. The other end, facing the firer when the sight is assembled to the rifle, is inscribed with a range-scale graduated from 25-100 meters in steps of 25 meters. To give the desired range, the body is rotated and the appropriate graduation brought opposite a pointer on the carrier plate. The body is then held in position by a ball and spring detent.

(c) Ammunition

Only one type of ammunition has been identified to date. This is a hollow

[redacted]

charge antitank grenade with a tubular tail which fits over the spigot of the discharger, see figure 7. The grenade is grey-green in color. The head is bell-shaped and contains the explosive filling, which is hollowed out to a depth of .79 inch and contained by a concave aluminum diaphragm. The head is closed by a slightly convex metal cap.

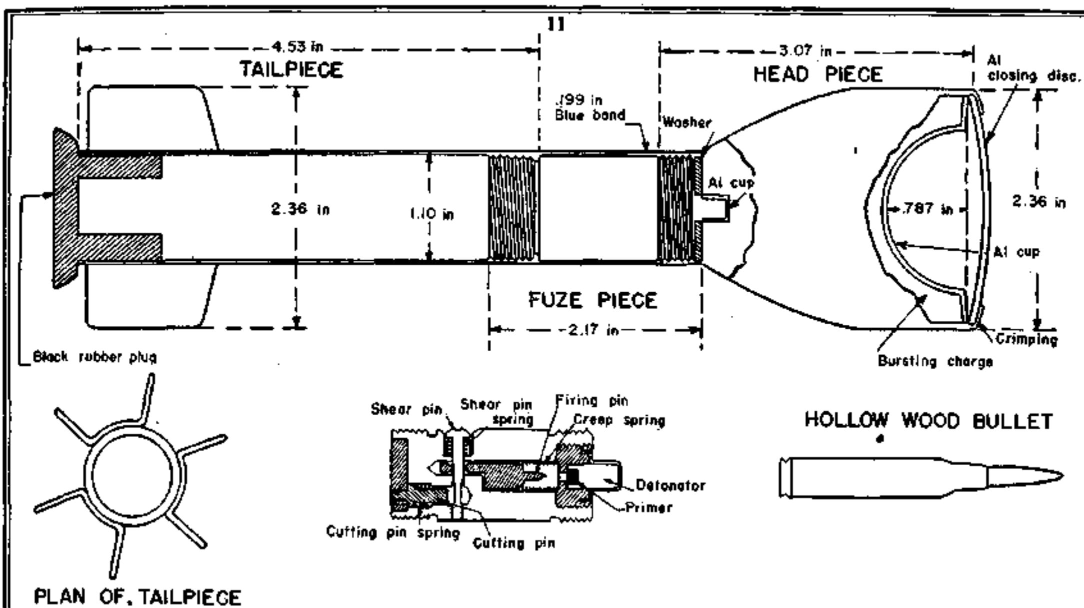


FIG. 7 GRENADE FOR SPIGOT TYPE DISCHARGER

The fuze body, which is cylindrical, screws into the base of the head. On firing, pressure acts on a cutting pin, the base of which is flush with the base of the fuze. This shears a safety pin which is ejected by a spring. The firing pin can then set forward on impact into the detonator. The tail screws into the base of the fuze. It is tubular and has six tail fins near the base. The grenade is propelled by means of a wooden-bullet blank cartridge. Until needed, this cartridge is carried in the tail tube of the grenade which is closed by a rubber plug.

18. JAPANESE 250-KG HE AND INCENDIARY BOMB

The high-explosive, incendiary bomb is one of the most effective instruments for the crippling and destruction of military and economic objectives. The following details and diagrams relative to the Japanese 250-kg high-explosive and incendiary bomb are based on a field report made by trained bomb disposal officers in New Guinea.

[redacted]

*   *

a. Details

Overall length	9 ft 9 in
Diameter of body	12 in
Wall thickness	7/32 in
Total weight	550 lb (approx)
Main filling	HE, and 750 (approx) incendiary cylinders.
Color	Light grey
Markings	Red band on tail. 6 in silver band on end of nose.

b. Use

Due to "Air bursts", and propulsion by the HE charge, incendiary cylinders are showered over a comparatively large area. Likely targets would be grounded airplanes, airfield installations, munition and supply dumps, and buildings.

The known radius of action of the incendiary cylinders is 176 yards.

c. Description

The body is made up in three separate parts -- the barrel, a cast steel nose, and a conical-shaped tail-unit.

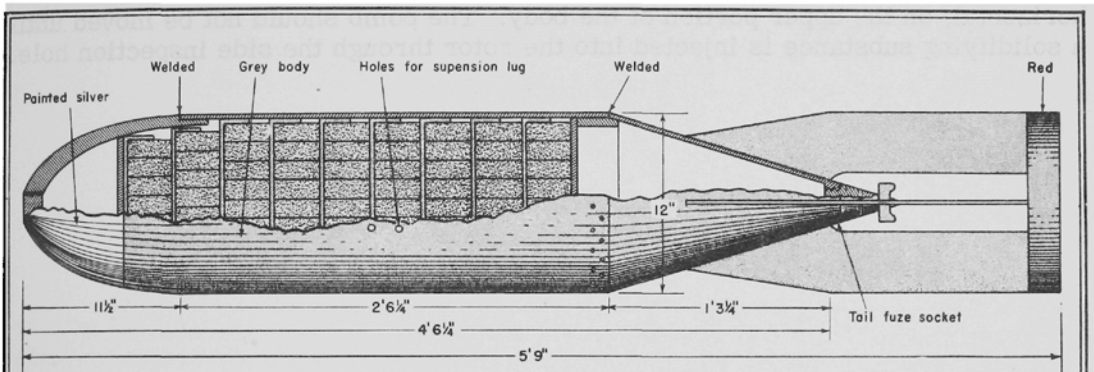
(1) There are ten layers of incendiary cylinders in the barrel, stacked on end and separated by perforated celluloid trays, the whole being retained in the barrel by front and rear perforated steel closing disks.

(2) The nose has a threaded opening at the front end for the fuze. The rear end is machined down to form a spigot over which the barrel is fitted and the joint welded externally. The front perforated steel closing disk fits into an internal machined recess. Two trays of cylinders extend into the nose-piece. An HE charge surrounding the gaine of the nose fuze is housed in front of the closing disk.

(3) The tail unit is made of 3/16 inch steel and is connected to the barrel by a welded cast-steel insert. A tail fuze-adaptor is welded to the apex of the cone. Four tail fins 1/16 inch in thickness with a cylindrical stablizing band and a perforated steel closing plate are welded to the sides of the cone. Four smaller subsidiary tail fins are interspaced between the normal fins and positioned closer to the barrel of the bomb.

(4) The incendiary filling consists of approximately 750 incendiary cylinders. These are pieces of 1 1/8 inch external diameter m.s. tubing of 1/8 inch wall thickness, 2 3/4 inches in length and filled with what is thought to be a mixture of rubber impregnated with phosphorus.

(5) A tail-fuze is screwed into the threaded adaptor welded to the tail cone. This fuze incorporates a clockwork mechanism, and is designed to achieve an air burst 150 feet to 200 feet above the ground. It has a delicately balanced



250 KG H.E. INCENDIARY BOMB

firing pin, which would respond to a slight jar in the case of an unexploded bomb. Arming vanes are incorporated in the fuze.

There is a nose-fuze which, when fitted with an instantaneous-type mechanism is thought to detonate the bomb on impact should the tail-fuze fail to function as intended.

d. Action

Normally these bombs burst at a height of 150 to 200 feet above the ground, so that presumably the tail-fuze is capable of being timed to operate in accordance with the proposed height of release of the bombs. When the tail-fuze functions as above, the HE filling detonates, bursting the bomb and showering the area beneath with incendiary cylinders.

The incendiary cylinders are propelled with great force; some have penetrated hard ground to a depth of four inches. They burn fiercely for about 65 seconds, the steel attaining a red heat and charring wood four minutes after ignition has taken place. Very few cylinders were found unburnt. Some were found as far as 176 yards from the point over which the bomb had burst.

Of four bombs released from an altitude of 20,000 to 26,000 feet, in one area, three burst at heights of 150 to 200 feet above the target, but one penetrated the ground to a depth of three inches before detonating. Apparently this bomb was one in which the tail-fuze failed to operate as intended, detonation being caused by the nose-fuze functioning on impact with the ground.

e. Disposal

Where a bomb fails to explode, the tail-fuze, of the clockwork type and

[redacted]

incorporating a delicately balanced firing pin, will most likely be in an extremely sensitive condition and readily susceptible to a slight jar or movement of the bomb.

The fuze can be identified by a graduated setting scale, 0 to 50 seconds horizontal, on the upper portion of the body. The bomb should not be moved until a solidifying substance is injected into the rotor through the side inspection hole.

SECTION II

AXIS AERIAL GAS WEAPONS

[redacted]

AXIS AERIAL GAS WEAPONS

The air weapon is new as far as gas warfare is concerned. In the event chemical warfare breaks out we can expect large scale low-altitude spray attacks with vesicants as well as concentrated bombing with vesicant and non-persistent gases.

I GERMANY

AERIAL SPRAYS

a. Spray Apparatus

(1) Nebelgerät V.200. -- This spray apparatus, suitable for use with either smoke or gas, is reported to approximate a 250 kg (550 lb) bomb in size and weight. Its capacity is stated to be 25 gallons of smoke liquid or vesicant gas. At 200 mph a strip about 660 yards in length may be contaminated during the emission period of six to seven seconds. (Note: This apparatus has previously been reported as having a capacity of 44 gallons).

(2) Nebelgerät S.300. -- A larger apparatus than the V.200, the S.300, while intended primarily for the laying of smoke screens, presumably may be used for spraying vesicant gases. It is pressure operated and consists of a cylindrical 60-gallon tank, magnetic control valves and an emission pipe. The emission is operated electrically from a switch-box near the observer's seat and can be interrupted at will. In the Dornier 217-E-1, it is carried in the bomb stowage compartment where it may be jettisoned at any time.

A German document states that a minimum altitude of 30 meters (100 feet) is necessary for cloud emission.

A number of reports mention experiments conducted at Weiner Neustadt, 30 miles south of Vienna, with gas spray apparatus installed in the Dornier 217 airplane. Other reports state that a squadron of Dorniers is equipped for gas spray and that such equipment might be installed on other types of airplanes, especially the Heinkel 111.

(3) Chema Fuma L.90 and L.190. -- Two types of gravity-operated spray apparatus, developed by the Czech firm of Chema, are available to the enemy. These may be used either for gas or smoke by a simple change of nozzles and the size chosen probably depends upon the speed of the airplane. Their general characteristics are as follows:

	Fuma L.90	Fuma L.190
Capacity	90 liters (23.8 gallons)	190 liters (50.2 gallons)
Weight empty	97 pounds	132 pounds
Weight charged (smoke liquid)	440 pounds	880 pounds

[redacted]

It is reported that about 1,000 of these spray apparatus had been produced at the time the Germans occupied Czechoslovakia, in addition, that these apparatus have previously been reported as having capacities of 20 and 42 gallons, respectively.

b. Miscellaneous

During 1941, a report from a source usually considered reliable, mentions a Messerschmitt with motors cut off, capable of gliding some 200 kilometers (124 miles) from a height of 20,000 feet. It is stated that the plane is equipped with reservoirs definitely designed to hold mustard gas. The reservoirs are equipped with spraying devices and the plane's motors are utilized to keep the mustard gas in the reservoirs under pressure.

One type of German apparatus for spraying toxic gases from aircraft is reported to hold 200 kg (440 lbs) of mustard gas. When functioned at a height of 75 to 80 feet, it contaminates a strip 2,500 feet long by 65 feet wide to an average density of 100 grams per square meter.

c. Gas Loads for Aircraft and Gliders

The following table represents an estimate of the gas loads that may be carried by German aircraft and gliders:

Aircraft	Max. disposable load (lbs)	Approx. Net Liquid gas load (lbs)	Max. still air range (miles)
Ju. 88	6,400	4,800	850
He. 111	6,200	4,600	1,400
Do. 217	6,600	4,900	1,000
Fw. 200	8,800	6,600	1,250
He. 177	15,800	11,800	1,350
Ju. 87D	4,000	3,600	estd. 375
Ju. 288	6,600	4,900	estd. 1,200
Me. 109E	550	400	550
Me. 109F	1,100	800	500
Me. 109G	1,100	800	475
Me. 110	3,300	2,500	750
Me. 210	4,400	3,300	1,350
Ju. 52	4,000	3,000	800
Ju. 90	12,000	9,000	800
Ju. 290	estd. 22,000	16,500	1,700
Me. 323	estd. 20,000 to 26,000	15,000 to 19,500	?

[redacted]

Glider			
DFS 230	2,800	2,100	) Dependent upon
Go.242	5,300	4,000	) type of tug.
Gigant	estd. 26,000	19,500	)

The above figures are unlikely to be attained in practice and indicate the maximum possible effort.

d. Description of Gliders

In view of the possible use of gliders for aerial spraying, brief descriptions of the three main types so far identified are as follows:

(1) DFS 230. -- A high-wing monoplane of conventional design, carrying a useful load of about one ton, or 10 fully equipped troops, including two pilots. A recent modification has been the installation of dual control.

(2) Go.242. -- A high-wing monoplane with the tail unit carried on two booms, the crew and freight being accommodated in a central compartment under the center section of the wing. The tail of the compartment hinges upward to facilitate loading. This glider carries a useful load of two and one half tons or 23 fully equipped troops, including two pilots.

(3) Gigant. -- This 178-foot-span glider, (see Tactical and Technical Trends No. 21, p. 1) previously known as the Merseburg, has now been identified as the "Gigant". It is a single-fuselage, high-wing monoplane with a gross wing area of about 3,200 square feet. A reliable report indicates that the fuselage has at least two decks, the upper deck floor being detachable in sections, making possible the stowage of bulky freight. The maximum useful load is about 12 tons or approximately 130 fully equipped troops. Motor vehicles or small tanks can be accommodated. The report also states that this glider has been seen towed by the twin-fuselage Heinkel.

e. Estimated Towing Ranges

By way of example, the following estimated towing ranges are given:

Glider Type	No. of Gliders Towed	Tug	No. of Tugs	Calculated Cruising Speed mph	Max. Range Miles
DFS 230	1	Ju. 52	1	110	800
DFS 230	1	Hs.126	1	120	630
Go. 242	1	Ju.52	1	108	495
Gigant	1	Ju.52	2	110	500

[redacted]

GAS BOMBS

Marked attention has been given by the Germans to aerial gas bombs. The figures given below probably indicate the size rather than the weight of the bomb. Gas bombs may be lighter than HE bombs of the same size.

(1) 10-kg (22 lb) K.C.* 10, chemical shrapnel bomb. -- This is primarily an antipersonnel bomb, in which a small amount of toxic smoke agent may be incorporated. It is similar in appearance to the S.C.** 10-kg antipersonnel bomb and probably has the same type of mechanical nose impact fuse. In addition to the chemical effect within a radius of about 22 yards from point of impact, the splinters are effective up to 45 yards.

(2) 50-kg (110 lb) K.C.50, mustard gas bomb. -- This bomb is about the same size as the S.C.50-kg HE bomb. Equipped with a highly sensitive electrical impact fuse, and an area of about 22 yards radius from point of burst is contaminated. It is provided with a small burster for ground contamination and with a larger burster for personnel effect.

(3) 250-kg (552 lb) K.C.250, mustard gas bomb. -- With a time fuse to operate when within several hundred feet of the ground, this bomb will contaminate an area of 5,000 to 6,000 square yards. It is about the same size as the S.C.250-kg HE bomb. The C250 (Flam.) incendiary bomb case may be used as the gas container.

(4) 1000-kg (2,204 lb) K.C.1000, gas bomb. -- Phosgene or other lung gasses are likely to be used in this bomb. There may be an impact fuse and small bursting charge, or the bomb may be designed to break upon impact.

II. ITALY

AERIAL SPRAYS

a. General

Reports regarding the use of vesicant gases by means of aerial sprays in the Abyssinian campaign are conflicting. There is no direct evidence that Italian land planes are equipped with spray apparatus, but captured documents describe a spray apparatus, Irroratore B, two of which are carried outside the fuselage of the seaplane Cant.Z. 501. Each tank has a capacity of 180 liters (47.5 gallons) of either mustard gas or smoke liquid, with a total emission time of 20 seconds.

b. Gas Loads for Aircraft

The following table represents an estimate of the liquid gas loads that may be carried by Italian aircraft:

---

*Kampfstoff Cylindrisch--thin-walled gas bomb

**Spreng Cylindrisch--thin-walled general purpose bomb

[redacted]

Aircraft	Maximum disposable load (lbs)	Net liquid* gas load (lbs)	Maximum still air range (miles)
BOMBERS			
Cant Z. 1007 bis	2,700	2,000	1,150
Fiat B.R. 20 M.	3,500	2,600	1,500
Piaggio P. 108	10,000	7,500	990
Savoia Marchetti S.M.79	2,900	2,200	1,760
S.M.84	3,500	2,600	830
S.M.82	8,200	6,100	1,250
S.M.75	3,400	2,500	1,490
FIGHTERS			
C.R. 42	250	200	530
Fiat G.50	250	200	320
Macchi 200	250	200	400
202	250	200	400
Re 2001	1,100	800	?

*Column 3 shows quantities carried with low-pressure systems, or low-pressure systems plus bombs.

The above figures represent the maximum loads of liquid gas which it would be possible to carry.

GAS BOMBS

It has been clearly established that aircraft bombs filled with mustard gas were used by the Fascists against the Abyssinians. Such bombs fitted with time fuzes to explode several hundred feet in the air, led to reports that aerial sprays were extensively employed. It is reported that in addition to the use of many 105-mm artillery shells, the Fascists dropped close to 5,000 mustard gas bombs from aircraft upon the defenseless Ethiopians.

(1) Gas-filled aircraft bombs, as shown in the following table, have been identified from captured Italian documents and other reliable sources:

[redacted]

New Designation	Old Designation	English Equivalent	Nature & Wt. of filling	Wt. of Complete Bomb	Dia. of Bomb body	Overall Length
Bomba	Bomba	Bomb	Pounds	Pounds	Inches	Inches
500 C.	C.500 T.	C.W. with Air Burst	HE ? Mustard 462.8	617.1 (or 656.8)	18.0	96.6
100 C.	C.100 P.	C. W.	HE 62.2 DA* 31.4	224.6	10.7	50.2
40 C.	C. 40 P.	C. W.	DA 14.3 HE 28.6	103.4	9.0	32.3
15 C.	C. 15 P.	C. W.	HE 7.4 DA 3.7	35.2	4.7	31.0
4 C.	Doppio Spezzone C.	C. W.	HE 1.5 DA .7	6.2 ?	2.7	12.2
2 C.	Spezzone C.	C. W.	HE .6 DA .3	3.4	2.7	6.1
	Furetto	C. W. Generator	Lacrimator 10 22.0	55	6.3	32.7

Notes:

According to a recent report these bombs are painted yellow, with a Geneva Cross indicating the filling. With the exception of the type 500 C. and the Bomba Furetto, these bombs are filled with DA.* They have a bursting charge approximately double the weight of the gas fillings and are fitted with percussion fuzes.

The 500 C. has a time fuze and a relatively small bursting charge, indicating that it is filled with blister gas and is described as a vaporizing percussion bomb.

Other than the 500 C., the weights of these bombs roughly correspond with their nomenclature. No doubt the 500 C. is so named because it has the same external dimensions as the 500-kg (110 lb) HE bomb and would fit the same bomb racks. Naturally, a gas-filled bomb of the same dimensions, having a thinner metal case, would be considerably lighter in weight.

(2) Aerial Gas (or Incendiary) Container. -- Among Italian chemical warfare material captured near Tripoli a number of sheet metal cylindrical

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*Diphenylchlorarsine

[redacted]

containers 5 feet in length and 10 1/2 inches in diameter were found. They are painted a battleship gray, with a 1 3/4 inch yellow band circling the center of the body, and weigh approximately 60 pounds, empty.

The body of the container has eight chambers, each 2 1/4 inches in diameter and 28 inches long. The tail end of each chamber is sealed and fitted with a spring platform. The nose-end is fitted with a detachable steel plate covering the end of all eight chambers, and is held in position by a release pin connected with a wire cable running through the center of the container. The nose proper consists of an aluminum dome, which is a push-fit onto the body, held by means of four spring clips.

An ingenious retarding device, attached to the tail, is operated by a clockwork mechanism calibrated from 0 to 20 seconds. On release of the container from the aircraft, the retarding device functions at the time set. Simultaneously, the release pin holding the guard plate is removed by means of the attached wire cable connected to the clockwork mechanism. Due to the sudden decrease in the rate of fall, the contents of the inner tubes (gas or incendiary bombs) are forced down, with the assistance of the spring platforms in the tubes, and overcome the four spring clips by which the nose is attached. The nose and guard plate thereby fall away allowing the bombs to scatter.

No bombs to fit the container were found, but since it is similar in design to the Italian incendiary container used in Caproni aircraft, it is logical to assume that the container was designed for gas or incendiary bombs.

III. JAPAN

AERIAL SPRAYS

Other than an aircraft spray spread from leak-proof tanks behind the engine cowl, there has been no definite information regarding the design, capacity, or chargings of spray apparatus in use. It is probable that here the Japanese, as in other chemical warfare matters, duplicate German apparatus.

Gas Loads and Ranges

The following table represents an estimate of the maximum gas loads that may be carried on the most likely types of aircraft at present in use by the Japanese Air Force:

[redacted]

AIRCRAFT	Max. disposable load (lbs)	Net liquid gas load (lbs)	Max. still air range (miles)
<u>Army Twin-engine Bombers</u>			
97 T.E. Bomber (Mitsubishi)	4,400	3,300	670
99 T.E. Bomber (Kawasaki ?)	2,200	1,650	630
00 T.E. Recco-Fighter (?)	1,100	830	1,275
<u>Army Single-engine Bombers and Recco's</u>	A V E R A G E		
98 Light Bomber-Recco (Kawasaki)			
97 " " " (Mitsubishi)	660	500	600 to 700
98 " " " (Mitsubishi)			
99 Ground Attack Recco (?)			
<u>Navy Twin-engine Bombers</u>			
96 T.E. Shore-Based Bomber (Mitsubishi)	2,200	1,650	1,710
01 T.E. Shore-Based Bomber (Mitsubishi)	3,300	2,500	1,660
<u>Navy Single-engine Deck-landing Bombers</u>			
97 Torpedo-Bomber (Mitsubishi & Nakajima)	1,760	1,300	645
99 Dive-Bomber (Aichi)	1,000	750	830

Army and Navy single-seater fighters and single-engined seaplanes are not included, as in these cases the gas load is unlikely to exceed 200 pounds.

GAS BOMBS

(1) <u>50-kg Gas Bomb, Type 92</u>. -- During early operations in China the Japanese used a 50-kg (110 lb) gas bomb, filled with a mixture of equal parts by weight of mustard gas and Lewisite. The chemical filling weighs 23 kilos (50.6 lbs). This is reported to be their chief chemical bomb.

The bomb is grayish green in color with a red and blue band at the nose. There are two yellow bands at opposite ends of the body with a white band in the center.

The bomb consists of a steel nose, cylindrical casing and tail assembly, with an overall length of 45 inches. The steel body has a wall thickness of 3/16 inch and is 26.4 inches long by 7.5 inches in diameter. A cast steel nose is attached to the body by three 1/4 inch grub screws and the sheet iron tail assembly, consisting

[redacted]

of four vanes welded to the tail cone, with two sets of box-type struts, is welded to the body.

On impact, the nose-fuse functions and the flash from the detonator cap ignites the first detonator to initiate the picric acid pellet. The main filling in the bomb nose then detonates to shear the grub screws and eject the body of the bomb from the shaft of entry. At the same time, the second striker is forced upwards to overcome the creep spring and to pierce and ignite the second detonator, which in turn ignites the booster charge. The detonation of the picric acid is then initiated in the exploder pocket, fracturing the bomb and spreading the blister gas.

(2) Miscellaneous Gas Bombs. -- Details of a 15-kg (33 lb) combination HE/toxic smoke bomb, possibly of the nose-gas variety, are also reported. The construction and operation of this bomb is similar to that of the 50-kg (110 lb) gas bomb.

A French report (July 1939) mentions 25, 50, 100 and 200-kg gas bombs filled with mustard gas, Lewisite, phosgene and diphosgene.

[redacted]

CORRECTIONS

AIR

No. 35 p.2: The illustration of the Savoia Marchetti S.M. 82 "Canguru" airplane was incorrectly captioned as a bomber. In fact, as set forth in the accompanying article, it is one of the best known Italian transport planes.

[redacted] UNCLASSIFIED

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SECTION I

UNCLASSIFIED [redacted] AIR

1. RUSSIAN COMBAT EXPERIENCES WITH THE FW-190

In all probability the Germans have used their FW-190s on the Russian front to a much lesser extent than elsewhere, and the standards of air combat on that front very likely differ from those over Western Europe and in the Mediterranean.

The following translation of an article which appeared in the "Red Fleet" compares some of the tactics used by the German and Russian fighter planes (FW-190 and La-5). It should be pointed out that these observations apply particularly to the Russian front and are not necessarily in line with experiences in other European theaters. This translation is published without evaluation or comment, purely for its informational value in presenting Russian opinion concerning the FW-190, as printed in the "Red Fleet."

* * *

The FW-190 first appeared on the Soviet-German front at the end of 1942. This is the first high-speed German fighter with an air-cooled engine. In comparison with the Me-109 and its modernized versions, the Me-109F and the Me-109G, the FW-190 is of a higher quality.

The speed of the FW-190 is slightly higher than that of the Messerschmitt; it also has more powerful armament and is more maneuverable in horizontal flight. The FW-190 has a large supply of ammunition, with 15 seconds of cannon fire, and 50 seconds of constant machine-gun fire. For this reason the gunners are not economical with their ammunition, and often open up the so-called "frightening fire". The pilots have good visibility laterally, forward, upward and rearward. A fairly good horizontal maneuver permits the FW-190 to turn at low speed without falling into a tail spin. An armored ring on the front part of the engine provides the pilot with reliable protection; for this reason, the FW-190's quite often make frontal attacks. In this way they differ from the Me-109s.

One shortcoming of the FW-190 is its weight. The lightest model of this plane weighs 3,500 kgs. (7,700 lbs), while the average weight is from 3,800 (8,360 lbs) to 3,900 kgs. (8,580 lbs). Since the FW-190 is so heavy and does not have a high-altitude engine, pilots do not like to fight in vertical maneuvers. Another weak point in the FW-190 is the poor visibility downward, both forward and rearward. The FW-190 is seriously handicapped in still another way; there is no armor around the gas tanks, which are situated under the pilot's seat and behind it. From below, the pilot is not protected in any way; from behind, the only protection is the ordinary seat-back with 15-mm of armor. Even bullets from our large caliber machine guns penetrate this armor, to say nothing of cannon.

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The main problem confronting our fliers is that of forcing the Germans to fight from positions advantageous to us.

The FW-190's eagerly make frontal attacks. Their methods of conducting fire in such cases is quite stereotyped. To begin with the Germans open fire with long-range ammunition from the horizontal cannons at a distance of 1,000 meters (3,200 feet). At 500 or 400 meters (1,000 or 1,300 feet) the FW-190 opens fire from all guns. Since the planes approach each other at an extremely great speed during frontal attacks one should never, under any circumstances, turn from the given course. Fire should be opened at a distance of 700 or 800 meters, (2,300 or 2,600 feet). Practice has shown that in frontal attacks both planes are so damaged that, in the majority of cases, they are compelled to drop out of the battle. Therefore, frontal attacks with FW-190's may be made only when the battle happens to be over our territory. Frontal engagements over enemy territory, or even more so in the enemy rear, should be avoided.

If a frontal attack of an FW-190 should fail the pilot usually attempts to change the attacks into a turning engagement. Being very stable and having a large range of speeds, the FW-190 will inevitably offer turning battle at a minimum speed. Our Lavochkin-5 may freely take up the challenge, if the pilot uses the elevator tabs correctly. By using your foot to hold the plane from falling into a tail spin you can turn the La-5 at an exceedingly low speed, thus keeping the FW from getting on your tail.

When fighting the La-5, the FW risks a vertical maneuver only at high speed. For example, let us assume that the first frontal attack of an FW failed. The plane then goes on ahead and prepares for a second frontal attack. If it fails a second time, the pilot turns sharply to the side and goes into a steep dive. On coming out of the dive, he picks up speed in horizontal flight and engages the opposing plane in a vertical maneuver.

Vertical-maneuver fighting with the FW-190 is usually of short duration since our planes have a better rate of climb than the German planes, and because the Germans are unable to withstand tense battles of any length.

The winner in present air battles must have an advantage in altitude. This is especially true with regard to the FW-190. "Once a comrade of mine and I engaged two FW-190's at a height of 3,500 meters (10,850 ft). After three energetic attacks we succeeded in chasing the two FW-190's down to 1,500 meters (4,650 ft). All the while we kept our advantage in height. As usual the German tried, out of an inverted turn, to get away and below, but I got one in my sight and shot it down. After that we immediately went up to 3,700 meters (11,470 ft) and met another group of FW-190's as they were attacking one of our Pe-2 bombers. We made use of our advantage in height and by vertical attacks succeeded in chasing the Germans away and also shot one down."

When following a diving FW you should never dive below the other enemy planes. When two planes dive the one following the leader should come out of the dive in such a way as to be at an advantage over the leading plane in height and

speed. In this way the tail of the leading plane will be protected; at the same time, the second plane will also be able to open up direct fire against the enemy.

In fighting the FW-190 our La-5 should force the Germans to fight by using the vertical maneuver. This may be achieved by constantly making vertical attacks. The first climb of the FW is usually good, the second worse, and the third altogether poor. This may be explained by the fact that the FW's great weight does not permit it to gather speed quickly in the vertical maneuver. After two or three persistent attacks by our fighters the FWs completely lose their advantage in height and in speed, and inevitably find themselves below. And because of this, they are sure to drop out of the battle into a straight dive (sometimes up to 90 degrees) with the idea of gaining height on the side, and then of coming in again from the side of the sun with an advantage in speed and height. At times it happens that the FW, after diving, does not gain altitude, but attempts to drop out of the battle altogether in low flight. However, the FW-190 is never able to come out of a dive below 300 or 250 meters (930 ft or 795 ft). Coming out of a dive, made from 1,500 meters (4,650 ft) and at an angle of 40 to 45 degrees, the FW-190 falls an extra 200 meters (620 ft).

A shortcoming of the FW-190 is its poor climbing ability. When climbing in order to get an altitude advantage over the enemy, there is a moment when the FW-190 "hangs" in the air. It is then convenient to fire. Therefore, when following a FW-190 in a dive, you should bring your plane out of the dive slightly before the FW comes out of it, in order to catch up with him on the vertical plane. In other words, when the FW comes out of the dive you should bring your plane out in such a way as to have an advantage over the enemy in height. If this can be achieved, the FW-190 becomes a fine target when it "hangs". Direct fire should be opened up at a short distance, 50 to 100 meters (150 to 300 ft). It should also be remembered that the weakest spots of the FW-190 are below and behind--the gasoline tanks and the pilot's legs, which are not protected.

Throughout the whole engagement with a FW-190, it is necessary to maintain the highest speed possible. The Lavochkin-5 will then have, when necessary, a good vertical maneuver, and consequently, the possibility of getting away from an enemy attack or on the contrary, of attacking. It should further be kept in mind that the La-5 and the FW-190 in outward appearance resemble each other very much; therefore, careful observation is of great importance. We may emphasize once more: never let an enemy plane gain an altitude advantage over you and you will win the fight.

ANTITANK

2. LOCATING MINE FIELDS

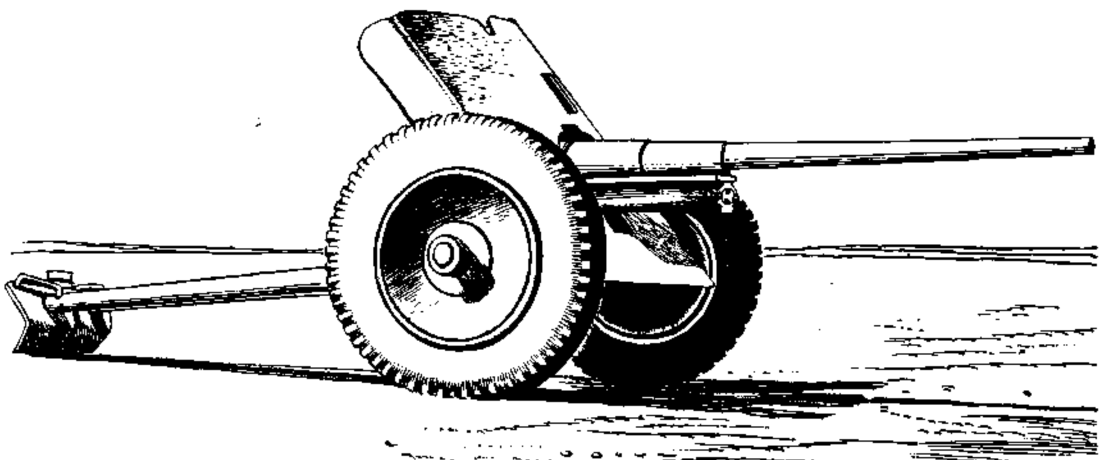
The commander of a reconnaissance unit recently returned from Africa states that the quickest and most practical way of locating mine fields when in pursuit of retreating German columns is to load a jeep with sand bags and drive

straight ahead. Mines are located when the jeep is blown up. This process is dangerous and expensive, but saves invaluable time, and frequently, the jeep crew is not injured because of the protection of the sand bags. A light tank may be similarly employed. If time is taken for a cautious advance, the Germans have attained their objective of delaying pursuit. The risk and loss must be assumed.

When the first fields are met and a road cleared, active pursuit is resumed. As the Germans are pressed, their mine laying becomes progressively more careless until mines can be spotted hastily dug in or hardly covered at all. This is the last phase of their orderly retreat.

3. NEW GERMAN 42/28-MM AT GUN

A brief preliminary report has recently come in from an Allied source concerning the new German small-caliber, taper-bored 42/28-mm (1.65 in-1.10 in) AT gun. This model has apparently made its appearance only this year, and in small numbers. Its muzzle velocity is stated as 4,100 feet per second, which is high for even so extreme a type of artillery. As will be noted from the accom-



NEW GERMAN 42/28-MM AT GUN

panying sketch, no muzzle brake is fitted, which seems rather odd in a weapon of this type, but its absence would permit the use of spigot grenades. Further details will be reported as soon as they are released, but the following are now

available:

Characteristics:

Caliber	-	42/28-mm (1.65 in-1.10 in)
Muzzle velocity	-	4,100 f/s
Rate of fire	-	10 to 12 rounds per minute
Horizontal angle of fire	-	44°
Vertical angle of fire from	-	-8° to +32°
Weight in firing position	-	990 lbs
Penetration	-	2.52 in of armor plate at a range of 547 yds

This gun is mounted on the old-type 37-mm antitank gun mount, but is a greatly improved antitank gun on account of its better penetration, due to its stepped-up muzzle velocity. The walls of the breech have been reinforced. This gun was manufactured at the Rhinemetall factory.

ARMORED

4. THE PZ-KW 5 (PANTHER) TANK

The German tank series 1 to 6 has now been filled in with the long-missing PzKw 5 (Panther) a fast, heavy, well-armored vehicle mounting a long 75-mm gun. It appears to be an intermediate type between the 22-ton PzKw 4 and the PzKw 6 (Tiger) tank. The Panther has a speed of about thirty-one miles per hour. It approximates (corresponds roughly to) our General Sherman, a tank which evoked complimentary comment in the Nazi press.

The following is a description of the tank: (It should be noted that practically all data contained in this report come from Russian sources).

Weight	45 tons
Crew	5
Armament	75-mm (2.95 in) gun, long barrel, (1943) 1 machine gun, MG-42, 7.92-mm
Ammunition	75 rounds (AP & HE)
Motor	Maybach, gasoline, 640 hp in rear of tank; the gas tanks are located on either side of motor
Cooling system	water
Ignition	magneto
Armor	front of turret and cannon shield 100 mm (3.94 in); upper front plate 85 mm (3.45 in) 57° inclination; lower front plate 75 mm (2.95 in) 53° inclination

[redacted]

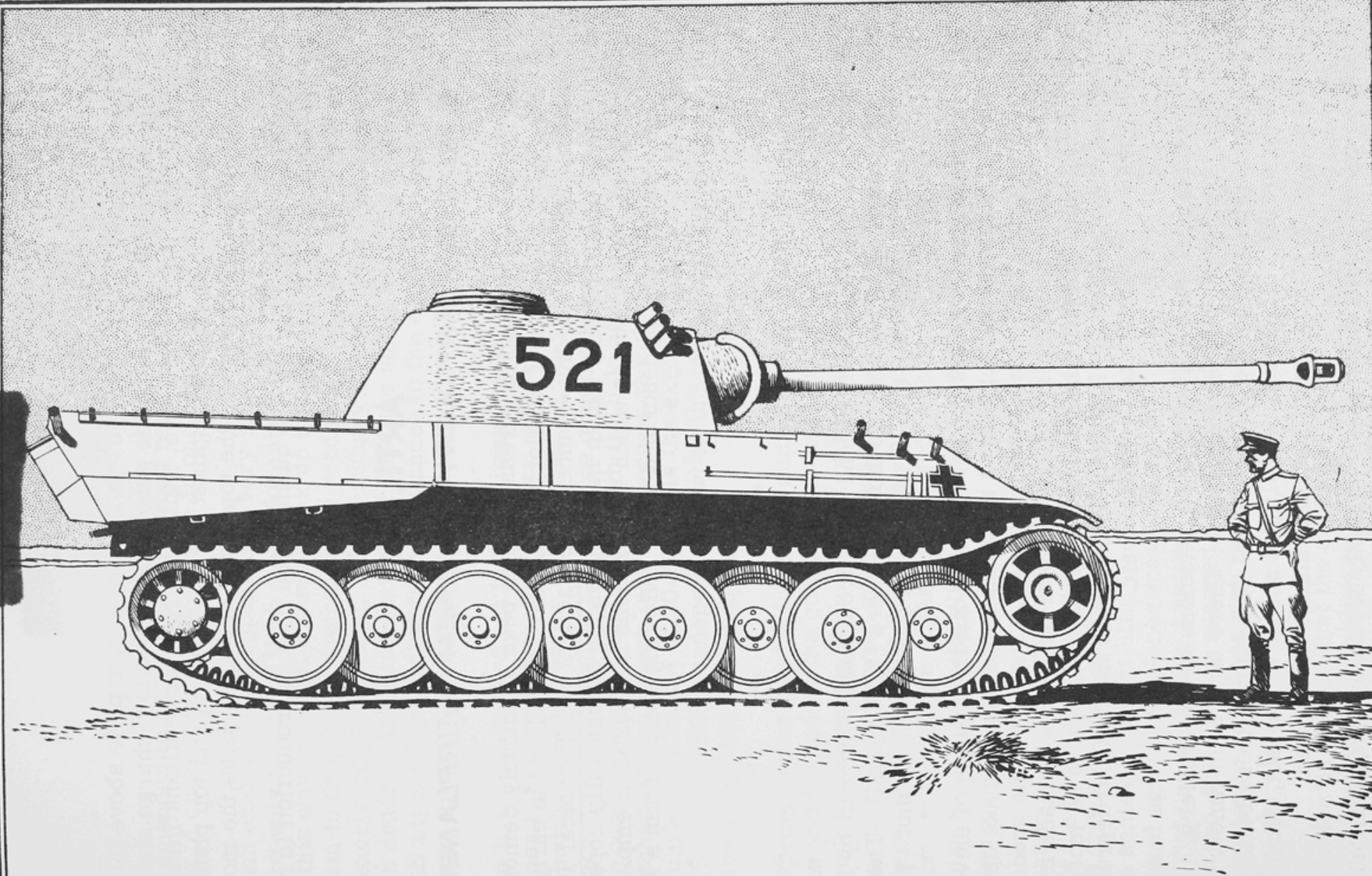
		side and rear plate 45 mm (1.78 in); top of turret & tank and bottom of tank 17 mm (.67 in)
Dimensions:		
width	-	11 ft 8 in (same as the PzKw 6)
length	-	22 ft 8 in (1 1/2 ft longer than the PzKw 6)
clearance	-	1 ft 8 in (10 cm)(3.9 in) more than the PzKw 6)
Caterpillar section	-	drive sprockets at front rear idlers 8 double rubber-tired bogie wheels 850 mm (33.46 in) in diameter on either side; torsion suspension system; hydraulic shock absorbers located inside tank; metal caterpillar tread 660 mm (25.62 in) wide
Maximum speed	-	50 km hr. (approx. 31 mph)
Range	-	170 km (approx. 105 miles)

The 75-mm gun is probably the new Pak. 41 AT gun with a muzzle velocity of 4,000 foot-seconds. The estimated armor penetration at 547 yards is 4.72 inches, and the life of the barrel from 500 to 600 rounds. The gun has direct sights to 1,500 meters or 1,640 yards. The 75-mm has an overall length of 18 feet 2 inches.

The Panther can also be easily converted for fording deep streams by attaching a flexible tube with float to the air intake. There is a special fitting in the top rear of the tank for attaching this tube.

Although provided with smaller armor and armament than the 6, the Panther has the same motor, thus giving it higher speed and maneuverability. This tank is also provided with light armor plate (not shown in the sketch) 4 to 6 millimeters thick along the side just above the suspension wheels and the inclined side armor plate.

Panther tanks are organized into separate tank battalions similar to the Tiger tanks. Many of these tanks have been used by the Germans during the July and August battles. The Russians state that this tank, although more maneuverable, is much easier to knock out than the PzKw 6. Fire from all types of rifles and machine guns directed against the peep holes, periscopes and the base of the turret and gun shield will blind or jam the parts. High-explosives and armor-piercing shells of 54-mm (2.12 in) caliber or higher, at 800 meters (875 yds) or less, are effective against the turret. Large caliber artillery and self-propelled cannon can put the Panther out of action at ordinary distances for effective fire. The inclined and vertical plates can be pierced by armor-piercing shells of 45 mm (1.78 in) caliber or higher. Incendiary armor-piercing shells are especially effective against the gasoline tanks and the ammunition located just in the rear of the driver.



THE PzKw 5 (PANTHER) TANK

[redacted]

The additional 4 to 6 mm (.157 to .236 in) armor plate above the suspension wheels is provided to reduce the penetration of hollow-charge shells but the Russians state that it is not effective. Antitank grenades, antitank mines and "Molotov cocktails" are effective against the weak bottom and top plates and the cooling and ventilating openings on the top of the tank just above the motor.

This tank is standard but the quantity and rate of production is not known.

ARTILLERY

5. RUSSIAN ARTILLERY VS ENEMY AIRPLANES

As the present war has progressed it has been effectively demonstrated that not only has the function of artillery not been displaced by the early spectacular performances of the dive-bomber (see Tactical and Technical Trends No. 36, p. 9) but that field artillery can in many instances successfully cope with the attacking airplane. The methods which the Russians have used in employing field artillery against airplanes is described in the following article from a Russian publication.

* * *

Field artillery may easily defend itself from enemy aircraft by using 76-mm field guns of all types and 122-mm howitzers (1938 model). The rate of fire of the latter is less than that of the guns, but their fire is more powerful.

Since field artillery does not have a large quadrant angle of elevation necessary for firing at aerial targets, it becomes necessary to make special fire positions for the artillery. In the ordinary gun pit a tunnel for the spades is made with a gradual slant from the center to the edge of the pit. It is made from 16 to 20 inches deep, which permits the quadrant angle of elevation to be increased 10 or 15 degrees, thus raising the limit of vertical angle from 40-50 degrees to 55-60. This makes it possible to fire at aircraft.

Depending upon the situation and the missions of the artillery, 1 or 2 guns of each battery can be used against airplanes. There have been times, however, when it became necessary to use all batteries. The guns of these batteries should of course be prepared beforehand, i.e., all pits should be dug out, necessary ammunition should be at hand, and firing data should be checked.

Since enemy planes may appear suddenly from any direction, orienting points in various directions (at a distance of from 3/4 to 1 1/4 miles) should be selected beforehand; likewise the distances should be ascertained and the range elevation determined. On the basis of these data, a card is made of the antiaircraft defense for each gun. Orienting points common to all the guns makes it much easier

for the commander to control the fire when repulsing raids. It gives him the opportunity of concentrating all his fire in one direction.

When enemy planes appear it is very important to open fire as soon as possible and with a certain lead, i.e., before the planes arrive at the orientation mark. In this way the shell-bursts break up the enemy combat formations and compel them to drop their bombs before reaching the target. Since the moment of fire is exceedingly important, it is necessary to keep a constant observation of the sky. In order to increase the rate of fire, the shells are prepared with the fuse ranges adjusted according to the distances to the orienting points. It is also useful to sort out the shells to be used for each given direction.

The firing is carried out in the following order. On the appearance of enemy planes the commander of the battery orders: "West (or south, east, or north, according to the direction in which the planes appear), target height 600, platoon (battery) fire." And in his turn, the commander of each gun commands: "Orienting point 5, height 600, fire!" With the help of the panoramic sight and a lever mechanism the gunner lays the piece on the given elevation. The azimuth circle should always be set at 30-00, while the extractor should be on a 0-00 setting. The gunner fires independently when the target appears at the point on the objective where the two lines meet.

A special experimental table was compiled with which, if given the height of the plane and its speed, the commander could easily adjust the sight tube, and also determine the average time of flight of the shell to the target. This table excludes complicated calculations during the battle, thus relieving the gunner who can then increase the rate of fire. A high rate of fire requires well-trained gun crews. Frequent trainings of the crews perfect them in quickly traversing the gun, in laying the piece on the given elevation, and in making corrections quickly and accurately.

Certain commanders gauge the effectiveness of field artillery against aircraft by the number of planes shot down. This point of view is entirely wrong. Since field artillery does not have special antiaircraft devices, it is extremely difficult to achieve a direct hit. On the other hand, the effectiveness of field artillery used against airplanes may be seen from the fact that in the course of 15 days of fighting at Velikie Luki the Germans attempted to bomb Russian combat formations and did not once succeed. The field guns threw up such a barrage of fire that the Germans did not risk penetrating it and dropped their bombs before reaching the objective.

Practice has shown that the command should not depend wholly upon antiaircraft fire, but should take care to use field artillery in protecting its combat formations. In this way the effectiveness of enemy air raids is greatly reduced.

[redacted]

CHEMICAL WARFARE

6. COMPARISON CHART OF WAR GASES

a. Axis Symbols Names and Markings

The accompanying chart is compiled primarily for quick comparison of German, Italian, and Japanese names and markings with those of the United States Army.

By following a chemical or common name from left to right one can easily obtain the Axis equivalent. Should an Axis shell marking or name be known, the American or British equivalent may be found easily.

Identifying odors, physiological effects and tactical classification are also shown.

b. All Known Gases are Not Shown

Some of the British and American "Secret" or experimental gases are not shown. Likewise, Axis "Secret" or "Rumor" gases are not included. Twenty-nine gases are now symbolized by the British and American authorities, although this chart identifies only twenty-three due to its restricted classification.

c. German Markings

The Germans may use the word cross or band interchangeably. Recent reports state that they have concluded that a band around a gas shell is easier to apply than a stencilled cross such as they used in the first World War. On this chart a "Gelbkreuz" (yellow cross) gas would appear as a "yellow band" marking.

d. Japanese Markings

Little is known about Japanese gas shells. Although Chinese reports claim that many have been captured, none have been examined in this office.

It has been confirmed however, that Japanese gas shells have been found, and that all have had a blue and red band on their nose.

e. French Markings

The French gases are listed solely because it is generally believed that the Germans have acquired the complete stock of French chemical munitions. The numbers accompanying the names have been known to supplant the French name as a shell marking. These are code numbers for the gas.

*Prepared by the Office of the Chief of Chemical Warfare Service. The accompanying chart does not include the chemical name and formula for each gas.

[redacted]

WAR GASES COMPARISON CHART

COMMON NAME	PHYSIOLOGICAL CLASSIFICATION	ODOR	TACTICAL CLASS	SYMBOLS, NAMES, AND SHELL MARKINGS OF--				
				GERMAN	FRENCH	ITALIAN	JAPANESE	UNITED STATES
Adamsite	Sternutator	Faint aromatic	Harassing	Adamsit	1 white band	Yellow body, red nose	Adamusaito: 1 red band	DM: 1 red band.
Arsine	Systemic poison	Faint phosphorus	Casualty	1 green band		Yellow body, red nose	Arushin: 1 blue band	SA.
Bromacetone	Lacrimator	Old leaves - bitter	Harassing	B-Stoff	Martonite or No. 9			BA.
Brombenzylcyanide	Lacrimator	Sour or bitter sweet	Harassing	T-Stoff: 1 white band	Camite or No. 21		Buromushian-ben-jiru: 1 green band	BBC.
Benzyl bromide	Lacrimator	Aromatic - watercress	Harassing	T-Stoff	Cyclite or No. 14		Buromuben-jiru	
Cyanogen bromide	Lacrimator	Piquant - bitter	Casualty	Ce-Stoff			Buromushian	
Chloracetophenone	Lacrimator	Apple blossoms	Harassing	T-Stoff: 1 white band		Cloroccetafenone: Yellow body, 1 white band	Kuroruasetofuenon: 1 green band	CN.
Chlorine	Lung irritant	Bleaching powder	Casualty	Chlor: 1 green band	Bertholite		Enso	Cl: 1 green band.
Chlorpicrin	Lung irritant	Flypaper	Casualty	Klop: 1 green band	Aquinite	Cloropicrina	Kurorupikurin: 1 yellow band (?)	PS: 2 green bands.
Diphenylchlorarsine	Sternutator	Shoe polish	Harassing	Clark I: 1 blue band	Rationite or No. 16: 1 white band	Difenilclorarsina: Yellow body, red nose	Jifuenirukurorua-rushin: 1 red band	DA: 1 red band.
Diphenylcyanarsine	Sternutator	Bitter almonds	Harassing	Clark II or Cyan Clark: 2 blue bands	1 white band	Red nose	Jifuenirushianaru-shin: 1 red band	DC: 1 red band.
Diphosgene	Lung irritant	Musty hay	Casualty	Perstoff or K-Stoff: 2 green bands	Surpalite	Difosgene	Jihosugen: 1 yellow band (?)	DP: 2 green bands.
Ethyliodoacetate	Lacrimator	Pear juice	Harassing	Jodessigester				
Ethyldichlorarsine	Vesicant and lung irritant	Biting - fruity	Casualty	Dick: 3 green bands		1 green band		ED: 2 green bands.
Hydrocyanic acid	Systemic poison (paralyzant)	Bitter almonds	Casualty	Blausäure: 1 green band	Vincennite or Manganite	1 red band	Seisan: 1 brown band	AC:
Lewisite	Vesicant	Geraniums	Casualty			Lewisite	Ruisaito: 1 white and 2 yellow bands	L: 2 green bands.
Lewisite and mustard	Vesicant		Casualty	Winterlost			1 white and 2 yellow bands	HL: 2 green bands.
Methyldichlorarsine	Vesicant and lung irritant		Casualty	Methyl Dick: 1 yellow band				MD.
Mustard	Vesicant	Garlic - onion	Casualty	Lost or Senf: 2 yellow bands	Yperite or No. 20	Iprite: Yellow body, 1 green band	Masutado or Iperitto: 1 white and 2 yellow bands	H: 2 green bands.
Nitrogen mustards	Vesicant	Faint fish - soft soap	Casualty	Stickstofflost: 1 yellow band				HN.
Phenyldichlorarsine	Vesicant and lung irritant	Bitter almonds	Casualty	Pfiffikus: 1 white band	Sternite or No. 22	Fenildiclorarsina		PD.
Phosgene	Lung irritant	Musty hay	Casualty	D-Stoff: 1 green band	Collongite or No. 5	Fosgene: Yellow body, 1 white band	Hosugen: 1 yellow band	CG: 1 green band.
Xylyl bromide	Lacrimator	Pungent - lilacs	Harassing	T-Stoff: 1 green band				

[redacted]

f. British and American Symbols (Abbreviations) Identical

The British and American authorities have recently adopted the same symbols for the common war gases. The standardized symbols (or abbreviations) are used in the chart.

The band markings of the American and British armies remain different and the British tie up band markings, code letters and numbers with their various gases. These, however, are secret, and cannot be included in this chart. The American band markings are shown for comparison with the known Axis markings.

Comment

Information on all markings is scarce due to the fact that gas has not been used yet by the Germans or Italians. Drastic changes in this chart probably will be required when and if gas warfare breaks out. It is more than likely, if gas is used by the enemy, that one or more of the gases shown on the accompanying chart will be employed. Officers in the field, regardless of the branch of service to which they may be attached, should always note very carefully any shell markings and color bands. This information with their reports should be forwarded promptly together with a complete description of the ammunition. In this way locations and date of use can be identified with all field laboratory reports.

ENGINEERS

7. PRINCIPLES OF CAMOUFLAGE

Camouflage became a major military tactic in the first World War when the French formed a "section de camouflage" and the British organized their own camouflage service as a unit of the Royal Engineers. In 1917 with the growing submarine peril, "dazzle painting" of war vessels and merchant ships was commonly applied. Since then a specially trained corps of experts in camouflage has been maintained by the armed forces of all countries. With the development of air power, the branches and services of this activity have grown in importance.

The following report contains some interesting material as developed at the British Camouflage Training Center in the Middle East and stresses the theoretical side of camouflage and its application in nature and in war.

* * *

Attention is called to the growing tendency, especially in the Middle East Theater, towards offensive, and away from defensive camouflages. In the battle of El Alamein and in subsequent battles of the British 8th Army during the past year, the offensive nature of camouflage technique has been noticeable.

The following summaries of the different divisions cover briefly the theoretical background, the application in nature and the application in war.

The fundamentals of camouflage as given in the school may be set down in six different divisions as indicated in the appropriate letter designations shown herewith.

a. Similar Color (or Background Resemblance)

(1) Theoretical Aspect

Every solid object appears in the field of vision as a patch of color differing more or less markedly both in hue and brightness from its surroundings. Such differences of color and tone provide the main clues which enable the eye to record, and the brain to perceive, an object's presence and identity.

It therefore follows that an important step towards the reduction of visibility or conspicuousness of any object lies in the modification of its color and tone to harmonize as closely as possible with its immediate surroundings.

(2) Application in Nature

The principle of color resemblance, or assimilated coloring, is widely employed in nature. Every major environment with a dominant type of color affords innumerable examples of the principle,--different members of the fauna wearing a concealing dress or uniform closely matching the surrounding country.

In the snowlands, white is the color employed by many mammals and birds such as the snowy owl, Greenland falcon, polar bear, and American polar hare. In the surface waters of the sea, blues, greens and grays predominate on the bodies of fishes such as the mackerel, tuna, herring and others. In the stony or sandy desert, light cinnamon, ochre, buff and sandy colors are found to be those worn by animals belonging to many groups--including birds (such as the desert larks, sand grouse, bustards, nightjars), mammals (such as the small African fox, jackal, jerboa), and many lizards, snakes and insects. Finally, in the evergreen foliage of tropical rain forests, green is the color usually adopted, as illustrated by many parrots, parrakeets, fruit pigeons, woodpeckers, tree lizards, tree frogs, tree snakes, and innumerable smaller forms such as beetles, praying mantis, leaf insects, grasshoppers, caterpillars and spiders.

A number of animals undergo a seasonal color change that is correlated with changes in their surroundings, as exhibited, for example, by the ptarmigan, and mountain hare, which in the spring shed their white winter colors and become brown or gray. Others such as flat fishes, squids, and certain lizards are capable of rapid, and sometimes almost instantaneous color change in accordance with the color of the background against which they come to rest.

(3) Application to War

The principle of color resemblance has obviously wide possibilities on military camouflage, and it is one which should never be neglected as a first and fundamental step towards reducing the visibility of any target--from the largest

[redacted]

to the smallest--whether it be a large installation or a tent, a railway or a small artillery piece, a tank or an individual soldier.

The color to be used will depend upon the predominant color of the surrounding country. For obvious reasons, the principle can be applied with greatest effect in the case of static targets, since mobility is bound to involve some changes in the color of the background against which an object is likely to be seen or photographed.

In such circumstances, the advisability of changing the color must not be overlooked. A gun or vehicle colored for cultivated surroundings in Europe will be an extremely conspicuous object in the Western Desert; so will a khaki-clad soldier when seen against the snow.

One of the devices most frequently employed in natural camouflage is that which is known as cryptic coloration. A cryptically colored animal is one which is so tinted and patterned that it is very difficult to see when viewed against its natural background, for example, the zebra or tiger.

No cryptic coloration can be devised which is effective in all circumstances. When an object is so colored that it is conspicuous against its surroundings by reason of its hue, there are two methods of concealment:

(a) To move the object to a background of suitable color, or
(b) To change the coloration of the object.

Most cryptically colored animals have an instinctive tendency to resort to the right background and there to remain motionless as long as they wish to be hidden. It is not enough, however, to resemble the background simply in color and pattern; a cryptically colored object must be so oriented that its pattern is coincident with that of the background, which, therefore, brings in behavior.

b. Behavior

(1) Theoretical Aspect

Frequent association, in the mind, of the physical make-up, actions and associated features of an object, allows one to immediately distinguish the object subsequently when observing only a portion of the characteristics,--the mind supplying the missing characteristics.

If, however, as in camouflage, an object is cryptically colored and placed on a suitable background but is not oriented correctly, if its movements do not conform to that which it is supposed to resemble, or, if its tracks are not the tracks of the object it is supposed to be, a question is raised immediately in one's mind and, by deduction, the true identity may be ascertained.

(2) Application in Nature

In nature, animals, insects, fish, and birds are disguised and sometimes resort to false behavior to mislead their enemies in defense, and their prey in offense.

Among animals, when the object to be imitated is normally motionless, the disguised creature also remains that way, thereby achieving some advantage such as food or safety. If the object copied is one which is usually in motion, for example weeds or leaves drifting in water, the animal imitates these movements with great exactness.

(3) Application in War

The application in war can be for defense or offense. It follows then, that when supplies and material especially, are cryptically colored and against a suitable ground, the object simulated must be followed in every detail; for example, a truck camouflaged to look like a haystack moving across the landscape and leaving tracks behind it, does not act as a haystack normally does and is therefore quickly detected.

c. Countershading

(1) Theoretical Aspect

Countershading is a system of compensating coloration whose function is to counteract and nullify the visual effects of light and shade. The effect of countershading is to produce on a solid object an illusory appearance of flatness.

Owing to the effect of unequal illumination falling upon its different surfaces, a solid object of uniform color presents to the eye the well-known appearance of light-and-shade, or relief, to which is due its appearance of solidity. By this means alone an object can be distinguished as a solid form even when it is placed before a background whose color and texture exactly match its own.

When any solid body is observed in its natural state its upper surfaces seem to be more brightly illuminated than its lower surfaces. This is because in nature the source of light is from the sun and the effect of this top lighting is to lighten the tone of the upper surfaces, while the lower parts, being in shade, appear darker.

By the use of paints or colorings and darkening the upper surfaces, and lightening those beneath and grading the tones on the sides from the dark to the light, it is possible to counteract the effect of the natural light and shade, and thus render a rounded body apparently flat. By careful countershading in this manner an object will become completely invisible at a short distance when placed before a suitable background.

[redacted]

(2) Application in Nature

Countershading is a concealing medium commonly found in nature such as the coloration of wild animals, the majority of mammals, birds, reptiles and fishes being colored darkest on the back, white on the belly, with intermediate tones graded round the flanks.

(3) Application in War

In military camouflage this principle of countershading is applicable to objects of all sizes. Upper surfaces should be painted and textured so as to conform to the color and tone of the surrounding country (background) and the sides graded and toned from this to the white which the under surfaces and parts in shade should be painted.

d. Disruption

(1) Theoretical Aspects

Observation of distant objects shows that their visibility depends upon their forming a continuous patch of color, bounded by a specific outline, which stands out more or less conspicuously against a darker or lighter background.

The eye is more readily attracted to circular markings and secondly to straight regular lines or symmetry, than to irregular lines, for in nature straight regular lines seldom exist. However, where in nature they do practically exist, nature has absorbed them in disruptive coloring.

When a combination of circles and straight lines are put together in a given manner they immediately suggest to the mind the distinguishing features of a certain object, i.e., the outline of a truck as seen from a distance is composed of definite straight and curved lines, which immediately call to one's mind that it is a truck and not a house.

Due to the natural intermingling of light waves reflected from an object and recorded by the eye or camera, greater differences in color are necessary for resolving them into their recognized elements. Likewise structural outline may be fortified by paralleling the shape with a lighter or darker color, or it may be diminished by cutting across the structural outline (disruption). The value of disruptive patterning depends upon its ability to nullify those clues upon which the eye depends for recognition by breaking up the visible continuity of surface and the regular outline which bounds it, thus transforming what is really a continuous surface into what appears to be a number of discontinuous surfaces and distracting attention from the object as a whole.

(2) Application in Nature

Application of disruption may be found in all forms of life, one of which is the very common marking stripes which pass from the bodies to the limbs or

[redacted]

wings of many wild animals, fishes, birds, and insects.

A common structural disruptive pattern may be seen in the zebra. The black marks of the zebra are close to right angles with the outline it presents when seen at a distance, and similarly, the stripes on frogs, which pass from the body to the two leg portions when in contracted position.

(3) Application in War

Application of disruptive coloration in war may be made to any object of military importance.

In general, elements of a disruptive pattern should be carried across adjacent surfaces of an object; e.g., from the roof to the walls of a building; from the hull into the upper parts of a ship. Such patterns cause discontinuous surfaces to appear continuous, whereas a break in the pattern at construction points emphasizes the very features which it is desired to obliterate.

e. Elimination of Shadow

(1) Theoretical Aspect

Shadow may be cast or retained by a surface, the shadow cast being a lessening in the intensity of light reflected from a surface because of an object between the light source and the major reflecting plane. The retained shadow represents the areas of shadow on the surface of, or within, an object, due to the obstruction or exclusion of light by structural features; such as the dark interior of a vehicle seen through a window or back curtains, or the inside of a tent, seen through the open tent flaps.

Since shadow is caused by necessary structural design, and shadow is recorded by the eye or camera because of absence of light, its obliteration may be obtained by including it in a non-significant pattern of an applied medium. Such medium itself reflects less light and thereby becomes less recognizable.

(2) Application in Nature

One of the most common applications of shadow elimination in nature is that of camouflaging the eyes of all forms of wild life. Those forms of wild life which depend upon natural camouflage for protection have a black or dark brown irregular patch which includes the eye and passes across the structural shape of the body. (Certain fowl extend their wings to the ground to include their body shadow.)

(3) Application in War

A special application of this principle is seen in the use of patterns to conceal typical structural details which, without proper treatment, are liable to provide a clue to recognition. Such features are the dark patches seen under the

chassis and mudguards of vehicles; the box-like recesses above the rear wheels of trucks; outline of shadow on track guard of tanks; elimination of ground shadow of buildings and structure, etc. The visible shape of such patches may be distorted by their inclusion within a dark patch of color of non-significant shape, so that the tell-tale clues to recognition are no longer present.

f. Features

(1) Theoretical Aspect

Disguise--visual deception--is effected not by the concealment of the existence of an object, but by the concealment of its nature or by the suggestion with dummies of objects or activities calculated to mislead the enemy. Disguise is the most specialized of all camouflage activities which depend upon it ultimately, for their success. Disguise is never confined to mimicry in appearance only: it is also a matter of deportment (in nature) and organized discipline (in war).

(2) Application in Nature

In nature, disguise may be defensive or aggressive in function, either serving to deceive a hunter as to the nature, posture, or whereabouts of his prey; or allowing the hunter to approach, to ambush, or to allure his quarry undetected. In the first case, the misleading appearance will deter or deflect attack by potential enemies; in the second, it will facilitate the capture of prospective victims.

Those features of disguise of a passive or defensive function may be found in caterpillars, stick-insects, etc., which simulate the appearance of twigs, certain tree frogs and moths which resemble the bark of trees, crabs and fishes resembling sea-weed.

Those whose function it is to draw attack away from a vital target to a non-vital target or dummy objective may be observed in butterflies with dummy eyes on their wing tips, which deflect attack by birds away from the head to a non-vital part of the body.

Those whose function is bluff, intimidation and threat may be found in various animals which resemble other animals feared by their own enemies, e.g., certain caterpillars which when being attacked resemble snakes; various insects which display large eye-like markings on their wings; various beetles and spiders which resemble, in appearance and habits, ants and wasps which are distasteful or dangerous to their natural enemies; other spiders which prey upon the ants which they themselves resemble.

Those features of disguise which have an aggressive function may be classified for approach, ambush or allurement.

Disguise which enables an animal to approach its prey or enemy undetected, through resemblance to some object which is not feared or suspected, may be found in certain fish, chameleons, and praying mantes which resemble leaves and

[redacted]

are able to approach their prey without being recognized.

Disguise which offers static concealment, or ambush may be found in ant-lion larvae which trap their prey from a concealed position dug in the sand; certain large frogs which cover themselves with sand and leaves and thus surprise prey approaching within striking distance.

Disguise which suggests an object, a target, attractive to a hunter, or to an enemy, and thus draws attack where it can suddenly and effectively be countered, may be found in various fishes which, though while camouflaged, attract their prey towards themselves by displaying a bait, e.g., having the tongue converted into a dummy worm; praying mantes resemble a flower and thus attract the insects upon which they feed.

(3) Application in War

Disguise in war as well as in nature can play a defensive or offensive function and follows in the same sequence as presented above in nature.

Those passive or defensive features of camouflage may change an object to appear like something innocuous or of no interest to the enemy; e.g., defended houses and pill boxes resembling native dwellings, haystacks, etc., observation posts constructed in dummy tree stumps, dummy dead horses or men, etc. Or, disguise whose function it is to draw attack away from a vital target to a non-vital or dummy objective; e.g., dummy dumps, gun positions, decoy fires, etc.

Those features of disguise whose purpose it is to bluff, intimidate or create a threat may be made of dummies or other types of deceptive devices--in defense to delay, or prevent attack by creating a false impression of force; or in an offensive role--to mislead the enemy as to present dispositions or future intentions; e.g., dummy defensive positions, dummy tanks or other material, and other deceptive contrivances which give the appearance of units or formations where none exist.

Those features of disguise which have an aggressive function for approach, ambush, or allurement may be found in such forms as: (for disguised approach;) the Trojan horse, sun shields and sniper suits.

For ambush, such installations as antitank guns in quick-release tent coverings, heavy machine guns in quick release brush covering, etc; and, in allurement or decoy, such disguise as mystery ships; feigned retreats; and all forms of "booby traps".

[redacted]

8. ENGINEER LESSONS FROM SICILY

Some points learned from the Sicilian operations are briefly listed in the following:

a. Mechanical Equipment

(1) Division rear area operators of mechanical equipment require further training to bring them to a satisfactory standard of efficiency.

(2) Due to faulty waterproofing and minor mechanical defects some bulldozers were laid up for repairs as long as 24 hours.

(3) Blades should be fitted to all bulldozers before landing.

(4) To give sufficient night vision a window with a steel shutter which can be opened is required for armored bulldozers.

b. Beach Tracks

(1) Beach tracks must be wide enough to allow two way traffic, so that an exit is not blocked by one damaged vehicle.

(2) Fascine or corduroy mats must be provided to prevent the track from being torn up by tracked vehicles.

c. Engineer Reconnaissance

(1) Houses required for dressing stations and the like, must be thoroughly searched early for booby traps of which many may be expected.

(2) Enemy minefields must be more clearly marked, once their locations have been determined.

d. American Naval Pontoon Piers

(1) These piers were an undoubted success. They were used in two ways:

With both ends fixed. In this case the sea end is attached to a tank landing ship which is "flooded down" (bottom resting on sea bed) to form a stable pier to which incoming ships can tie up and unload. The shore end of the pontoon pier is also flooded to rest on the bottom to give a firm footing.

With the sea end free. In this case the pier has to be moved or swung to tie up with the incoming craft. Using this method it is essential to have a compressor available to blow out the water in the flooded pontoon at the shore end before the pier is moved.

(2) The surface of the ramps must be of a type that remains non-skid when wet.

e. Mine Detectors

It is stressed again that mine detectors (and radio sets) must be waterproofed to prevent them becoming unserviceable during landing.

f. Engineer Tools

All tools brought ashore must be in first class order to avoid, for example, heads of sledge hammers coming off.

g. Landing of Supplies

In some cases Bailey bridges, pipelines, and bulk fuel storage material were loaded with vital small parts missing. Loading of engineer supplies must be supervised by engineers.

INFANTRY

9. SOME BASIC PRINCIPLES OF COASTAL DEFENSE

Allied Forces have successfully completed one of the greatest landing operations of all time in the invasion of Sicily and the Italian mainland. The world expectantly awaits Allied landings on the Axis occupied coast anywhere from Norway to Spain. The following translation of notes made by a German officer formerly attached to a corps responsible for Channel Coast defense indicates the manner in which the Germans have organized the Channel Coast defense.

* * *

a. Selection of Defense Areas

Owing to the shortage of troops, the defense will be organized into defense areas. A complete disposition in depth of the defense areas cannot be maintained at normal strength. As to the selection of the defense areas, the following essentials will have to be taken into consideration:

(1) Where does the enemy have facilities to land?
(2) Which landing beaches has access into the interior?
(3) Where are there important installations, the possession or destruction of which is of interest to the enemy?
(4) Finally, consider which parts of the coast do not lend themselves to landing operations (waters where navigation is difficult; islands constituting bastions off the coast; cliffs, wooded terrain, marshes, zones offering few lines of communication), and the sectors where landings are possible or likely will stand out.

b. Initial Organization of Defense Areas

For the moment, defense areas will be constituted and occupied only in those regions which lend themselves to landing operations. These areas will be selected subject to the following conditions:

(1) Weapons must command the greatest possible stretch of terrain. Consequently, it is not advisable to site guns on high points which overlook the general terrain, because then the beaten zone is restricted, and furthermore the weapon can not engage objectives within short range. In this manner, the risk of letting the enemy penetrate under the angle of fire is eliminated and it is not necessary to cope with defiladed areas.

(2) The defense areas will command as large a sector as possible. Owing to the shortage of troops, the number of supporting areas will be so reduced that the observation of the whole of the coastal sector will be impossible. By day, therefore, it will be necessary to place parties with sufficient striking power between the defense areas; whenever possible, one rifle squad equipped with a light machine gun. The method of alarm to be adopted in case of an enemy approach will have to be clearly explained and made known to every man in form of a special order. By night, patrols will be carried out by bicycle whenever possible.

c. Organization of the Sectors

Each company will retain, whenever possible, one platoon in reserve. The machine-gun companies will be split up in platoons and placed under command of the rifle companies--one platoon will be back, whenever possible, together with the battalion reserve. Heavy machine guns and light trench mortars should in principle be retained with the mobile reserves. The motorcyclists of the regiments are to be so grouped as to constitute heavy machine-gun groups.

With regard to the use of the machine guns, it is advisable, despite the present weakness in strength of the units, to keep the company organized in twelve rifle squads. It is necessary to remember then that the squads are weaker. The fastest possible means of liaison with all the defense areas will have to be ensured. All the defense areas will be connected with the C.P. by telephone if possible, or in any event by messenger. Where there is a shortage of telephone lines, steps will be taken to set up a relay system of communications. If, owing to the extent of the sector, no one company can be spared as battalion reserve, every available man will be used for counter attack, including transport and headquarters personnel, etc. The necessary training will be given at the earliest possible moment.

Sector commanders will not only make arrangements with the commanders of other arms of the Wehrmacht as to their role in the event of landings, but from now on they will also incorporate in their defense plan all the weapons in their sector. In this way some of the weapons will be available for use at other points where they are absolutely necessary.

d. Use of Artillery

Coastal batteries will not be placed in exposed positions close to the shore. They will be sited chiefly at the main points of resistance. Beyond the fact that they are exposed to enemy fire if sited at open spots, they are furthermore out of action as soon as the enemy has landed, by being exposed to direct attack.

Therefore they will be sited far enough inland and under cover, but in such way that they can engage the coastal belt during a landing. This use gives better results than the engagement of objectives at sea. When batteries are sited in the open it is absurd to have an observation post at a distance of 200 to 300 yards from the position. The very reason for siting batteries in the open is to enable both observing and firing from the same place.

Batteries will only be given one fire task. It is not enough to work out the firing data, plans must also be made for coordination. Use will be made of all existing means of communication. Radio sets will be kept as far as possible mobile so that they can be transferred to another observation post. In many quarters it is said that in the event of a successful enemy landing, the coastal batteries would be able to reverse their fire towards the land. This procedure only offers possible chances of success if corresponding observation posts have been installed. Firing from the map amounts to a waste of ammunition and endangers own troops.

e. Conduct of the Landing Battle

As regards the conduct of battle, the following may be said in brief: defense areas will be defended whatever the conditions may be, even if the enemy has landed and broken through. Local reserves will be used in the counterattack. If the counterattack fails, it will be necessary to block the enemy's advance from positions in the interior; these positions to be reconnoitered beforehand, must be held until the planned counterattack by larger reserves produces its effect.

10. JAPANESE TACTICS--ARAKAN CAMPAIGN

The following extracts taken from a recent report on the Arakan Campaign, of the period from April 27 to May 16, 1943, are given here to point up some phases of Japanese operations connected with this campaign. It should be remembered that in the particular area pertaining to this action, there are flat, coastal plains interspersed with numerous, small, tidal waterways; flat cultivated areas at this season of the year (spring) are dry and untended, with small foothills covered with light growth merging into thick jungle country in the Mayu mountains rising to 2,000 feet.

[redacted]

a. Defensive Tactics

When the Japanese is on the defensive, he digs in and stays there. He either prepares his position before occupying it, or if that is impossible, continually improves it during the night, resting and sleeping during daylight hours. His system of supporting fires is excellent and his placing of machine guns and mortars superb. He is prepared to sacrifice some of his own men as a result of mortar and artillery fire on his own positions, if they should be penetrated by his enemy. These casualties are few because of the overhead cover invariably furnished for his prepared pits and dugouts.

b. Weapons Employed

All of the Japanese guns so far fired in this area were thought to be the 75-mm mountain gun with a maximum of 9,000 yards in range. The Jap usually hauled this gun to the top of a hill to fire it. From the locations it is believed that the gun is a pack type and that these positions were chosen first because the Jap prefers simple conduct of fire and secondly because it is thought the guns have difficulty in clearing crests. There was an apparent shortage of ammunition since the guns did not fire often and when they did, not very many rounds were used on a target. Their adjustment usually consisted of one or two shots fired into an area after which they fired for effect. Guns were usually fired singly or in twos or threes, and with the exception of the battles before Donbaik, Htizwe and Indin, (see <u>Tactical and Technical Trends</u>, No. 32. p. 29) never over 4 guns were fired at any one time. The British knew that some Jap ammunition was of an incendiary nature but they believed that it was not phosphorous loaded and they stated that it probably contained gasoline or a volatile liquid of a similar nature. The explosion of this shell produced an orange-colored burst with large volumes of black smoke. Only once has the Jap been known to use 4 guns together in the form of a battery fire mission and although more than 4 guns have fired (as mentioned above) on a single target, this fire converged from separate localities. He frequently fired his guns and mortars simultaneously not only for their effect, but it is thought, so as to confuse our forces as to the exact location of his heavy weapons. His high explosive shell had both a delayed and a slightly delayed action fuse. He confined himself almost entirely to harassing types of fire and in this he was fairly accurate. His usual ranges were, it is believed, from 6,000 to 7,000 yards. On one occasion only, and then at two different times, he concentrated his guns on counterbattery. He has attempted interdiction but without success and has not fired for destruction. He was particularly successful in his counterbattery fire at first, in that his observers occupied high ground overlooking the British position at Donbaik from which they could spot at night all the guns on the front. Once, it is stated, in a surprise bombardment he delivered the fire of all his guns presumed to be 10 in number, on the British batteries in turn. The latter consisted at that time of 26 pieces, 3 of which were put out of action. The British artillery manned their guns and were successful in silencing the enemy. Later in the morning the Jap produced this same form and intensity of fire but the British were more nearly ready at this time and the duration was only one to two minutes. British artillerymen believe that they put out of action as many Japanese guns as they lost, although no exact data were ever available.

c. Use of Dogs

The Japanese used dogs on this front. Those observed had the appearance of the ordinary village mongrel or so-called "pi" dog. In the day time these dogs were seen coming up to our forward defended positions and when they discovered our men, they barked and went back. This may be fanciful and simply a coincidence. On another occasion, one dog and two men formed a scouting party, the dog preceding the men, and when he encountered the smell of our nearby troops he was observed to run back and warn the approaching Japanese scouts. On another occasion, six Japanese in an open glade of the jungle were observed to halt while passing through and their leader barked like a dog several times. Several minutes later a dog appeared with a scrap of paper, probably a note, tied to his neck. After looking at the piece of paper the patrol set off again accompanied by the dog. In no cases did the dogs appear to be imported but from their looks were those indigenous to this section of Burma. (It is believed that these dogs are not highly trained but that their propensity for friendship to man is being utilized as described. No dogs were on duty with the British forces).

d. Use of Animal Barking

The Jap has used cock-crowing and hyena barking as a means of signalling at night. He frequently puts out red lanterns and also uses red Very lights in his rear areas.

ORDNANCE

11. JAPANESE EQUIPMENT FOUND ON KISKA

Recent searches over the area abandoned by the Japanese at Kiska, as indicated from American sources, have resulted in the location of many hand grenades Type 91*, with attachment on the base, permitting grenade to be fired from the Model 89 grenade thrower. Gun ammunition for the 13-mm machine gun having almost the same dimensions as our 50-mm caliber, was also recovered. What was described as a new lighter and smaller type grenade with no serrations being of the concussion type also was found. The oldest among these had a date of manufacture of August 1942.

Model 93 land mines at one particular spot were laid so that each mine was wired upside down and connected to a can containing 30 blocks of TNT. This method was said to increase the explosive force three or four times, and enlarged thereby the danger area.

The Model 91 (1931) hand grenade can be either thrown or fired from the Model 89 grenade discharger. It can also be modified for use as a rifle grenade

*The Type 91 is practically indentical with the Type 97 except that the latter has no propellant charge container.

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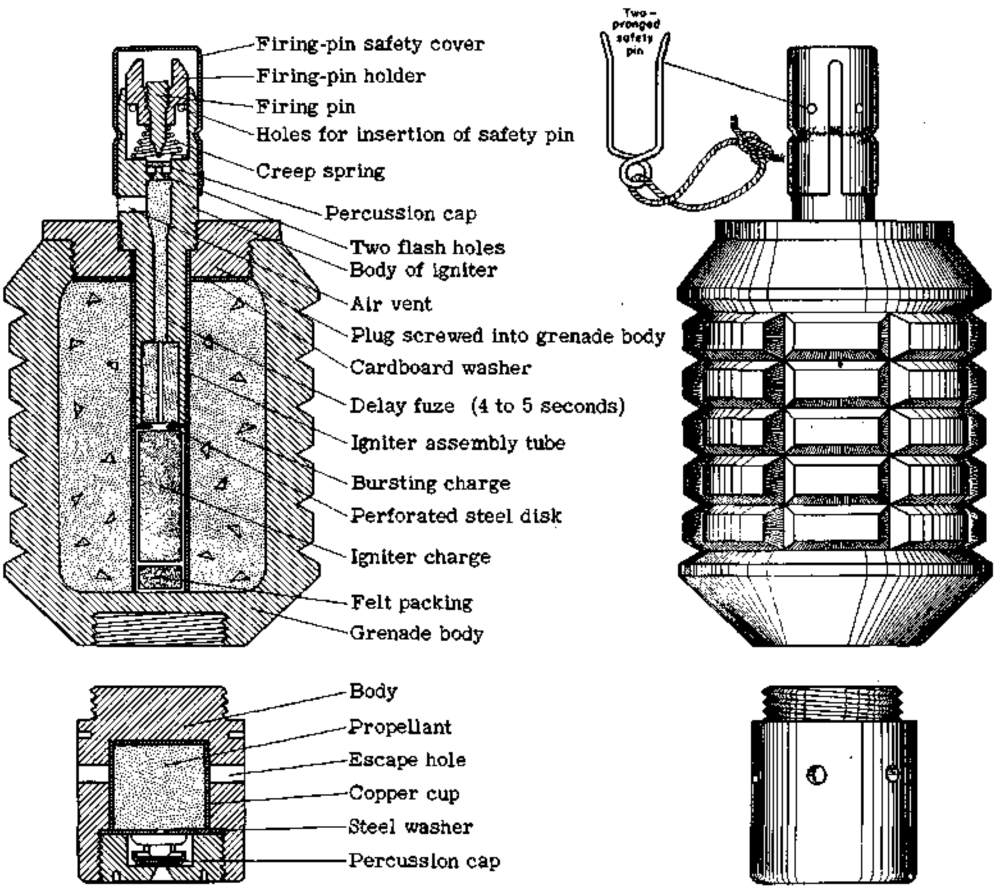
by substituting a tubular tail fin assembly for the propelling charge. This type can be recognized by the serrated black body, the brass safety cover and the perforated shell propelling charge screwed to the base.



JAPANESE TYPE 91 HAND GRENADE

The Model 97 hand grenade is believed to be carried by all Japanese front-line troops. This type hand grenade is easily recognized by its serrated black body as well as its brass fuze, which is identical with the fuze on the Model 91. The Model 97 can be used as a booby trap by pulling the safety pin and placing it under planks, chair seats, or the like. The weight of a man on the fuze is sufficient to function it.

[redacted]

12. GERMAN SPIKE BOMBS

A heavy type of nose spike for use on German bombs has been recently reported. It is thought that they are used to prevent ricochets in low level attacks. The bombs on which the nose spikes are affixed are termed Stachelbomben or "Stabo". They must be of the best quality and be specially shaped at the nose to take the spike. (See sketch next page).

The spikes used in the SC 50* and SD 70** bombs are made in one piece but those used in the larger bombs are in two pieces. Additional data pertaining to these bombs follow:

		Details of Spikes		
Bombs	Total Weight	Length	Diameter	Marking on Tail
SC 50	136.4 lb	18.8 in	1.8 in	Yellow stripe
SD 70	158.4 lb	18.8 in	1.8 in	Red stripe
SC 250	620.4 lb	22.8 in	3 in	Yellow stripe
SC 500		24 in		

13. JAPANESE AIR BOMBS (ARMY AND NAVY)

There is no separate Japanese air force such as the RAF and Luftwaffe and aerial operations are carried on by special departments of the Army and Navy. There is, therefore, a very distinct difference between the aircraft, bombs, fuzes, etc., produced by these two departments, both of which seem to have developed quite independently. Army aircraft are land-based entirely, whereas Navy aircraft are both carrier-based and land-based. Bomb racks, release mechanisms and fuze arming devices are quite different.

Listed below are the main general distinctions between army and navy types of bombs and fuzes. It is fully realized that these distinctions do not exist in all cases.

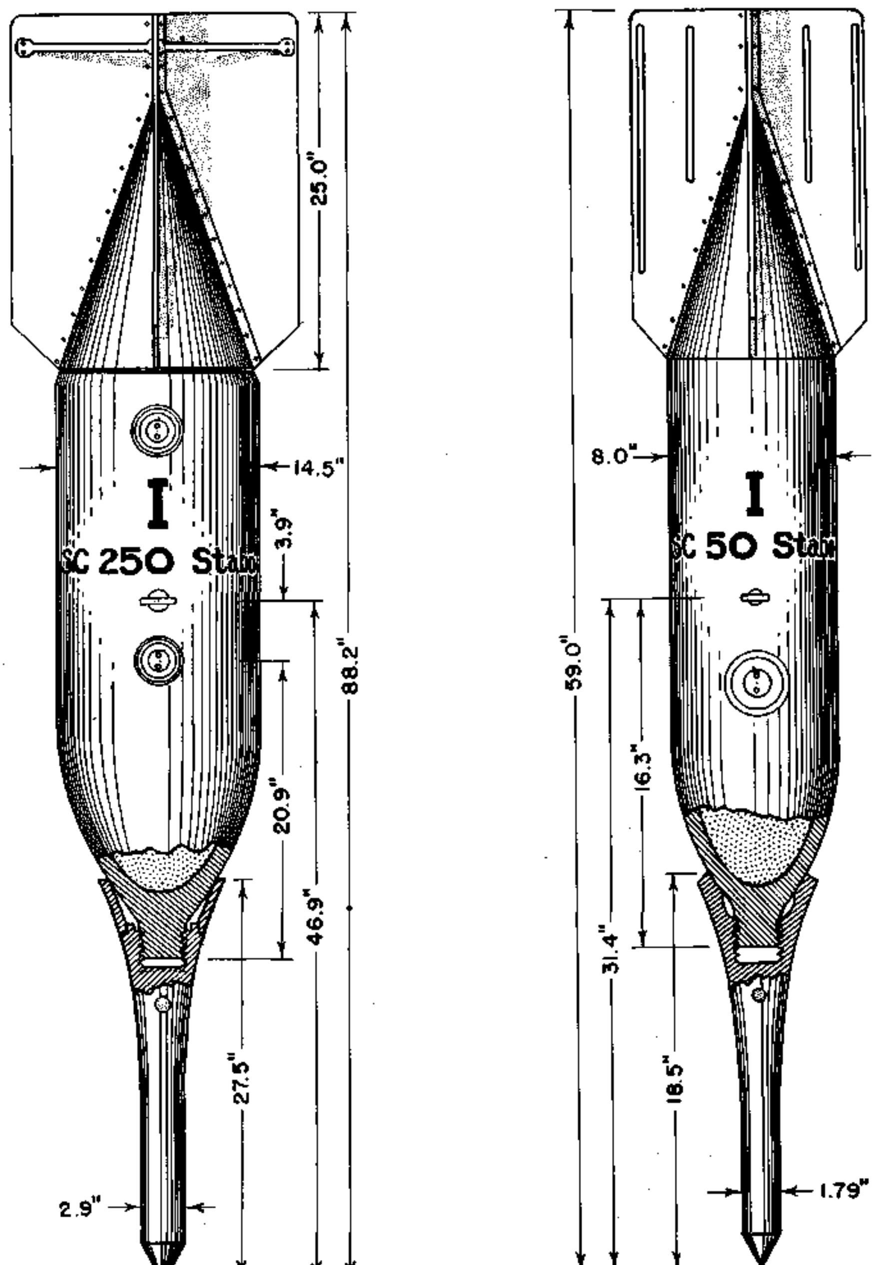
a. Body Construction

Army types have a screw-in nose-piece, and a tail unit welded to the main body. In naval types the tail cone is connected to the body by a separate internal insert; the nose is located by rivets or a weld, while the tail-unit is affixed by set screws; it is thus possible to remove the tail piece easily, by removing the set screws but not the nose piece. Suspension lugs are quite different because of the different types of release mechanisms; the army type is rectangular and hinged, while the navy type is a fixed U-bolt.

*SC designates a thin wall high-explosive bomb, achieves its effect chiefly by blast.

**SD designates a bomb which has a thick casing and achieves its effect chiefly by fragmentation.

[redacted]



TWO GERMAN SPIKE BOMBS

b. HE Fillings and Exploders

The general HE filling in army bombs is picric acid, contained in waxed cardboard containers and comprising three portions - nose, body, tail. Each portion is a loose fit inside the bomb and is retained by wax. The usual HE filling in navy bombs is hexanite and anisol mixture, or trinitroanisol, poured into the casing; the tail cone filling - if present - is separate and divided from the main portion by a cardboard washer. There are small standard army type boosters which initiate the main fillings, by means of an auxiliary picric acid booster. No navy standard type auxiliary boosters exist, the main fillings being initiated direct by a large standard booster screwed directly into the fuze base.

c. Markings

Markings on bombs give an indication of the arsenals in which manufactured. Some arsenals, such as at Tokyo, Osaka, Nagoya, Sakai are military; others (e.g. at Kure) are naval. Each arsenal has its characteristic Japanese inscription. It is thus easily possible to find the type (i.e. service) of bomb by noting the arsenal of manufacture. Naval munitions are usually marked with an anchor.

d. Bomb Classification

The following is a list of Japanese army and navy aircraft bombs taken from a British official source. It may be noted that bombs dropped on one area are normally of the same service. In the Ceylon raids (carrier-based aircraft) naval types were dropped.

e. Army Type Bombs

0.73 lb HE hollow charge
2.2 lb antipersonnel, incendiary
26.4 lb thermite incendiary (alleged)
33.1 lb HE antipersonnel
66.1 lb HE general purpose
110.2 lb HE general purpose
110.2 lb HE general purpose (modified)
110.2 lb phosphorus incendiary, Type 97
110.2/132.2 lb HE, incendiary, phosphorus
220.2 lb HE general purpose
550.8 lb HE general purpose (alleged)
Leaflet bomb

f. Navy Type Bombs

110.2/132.2 lb thermite incendiary
132.2 lb wax incendiary
132.2 lb HE general purpose Type 97
132.2 lb HE general purpose
132.2 lb HE general purpose Type 98

[redacted]

132.2 lb HE general purpose Type 99
550.8 lb HE general purpose Type 1
550.8 lb HE general purpose Type II
550.8 lb HE semi armor-piercing (alleged)
550.8 lb HE incendiary
1,102.0 lb HE semi armor-piercing (alleged)
1,652.4 lb HE AP

14. GERMAN MOBILE SHOPS

The vast mechanical equipment of the panzer division requires a great amount of repair and maintenance work; therefore, every unit of the division-- as well as the division itself -- has its own repair organization. The success of an attack, or the fate of the troops, often depends on the adequate repair facilities available at the right time. Frequently, the repair of some minor damage which cannot wait until the repair unit of the division arrives, might mean the success or failure of an engagement.

The following article taken from the October 1943 issue of the Ordnance Digest, published monthly by the Ordnance Department of the U.S. Army, describes the German mobile shop trucks and how certain features of these units compare with similar ones in use by our Army.

* * *

Field Service maintenance officers have made an examination of captured German mobile shop trucks at Aberdeen Proving Ground. These mobile shops are mounted on 4 1/2-ton Diesel-powered chassis, with dual rear wheels, and with front and rear drive.

The spare truck is mounted on a cargo-type body. The parts were stored in six steel cabinets, with various-sized drawers to accommodate the large and small parts. The drawers were made of steel, and have wooden dividers, with felt linings. The parts in the truck were for automotive equipment, and an item of great interest was noted--the number of spare parts that were stamped "Made in U. S. A." Another outstanding surprise was the absence of rust preventatives and grease, yet the parts were in fair condition, with only a slight amount of rust on them.

This particular spare-parts truck had been assembled in Germany early in 1943 and had been driven approximately 450 miles. The presence of the spare parts that had been made in the United States indicated that Germany had not only accumulated tremendous reserves but, despite 4 years of war, still has available some material from stock piles.

[redacted]

The German spare-parts truck compared favorably, in many respects, to our spare-parts truck. Both have cargo-type bodies and similar steel cabinets.

The German electrical mobile shop truck was equipped with a special van-type body which resembles our own van-type trucks. This body was equipped with a collapsible top similar to our new ST-6 body. The collapsible top construction was apparently made to conserve shipping space, as the top of the van body can be lowered to the same level of the truck cab. Another outstanding feature was the light construction of the van body. It was made of press-board or masonite. However, it appeared to be in fair condition notwithstanding the hard usage received.

Most of the tools in the electric repair truck were lost. There was some welding equipment, Diesel injection pump testers, oil and fuel analyzers, electrical testing equipment, a sewing machine, and a bench drill press. The benches, which were of steel cabinet type construction, had wooden drawers containing mortised recesses in which to fit the hand tools.

In the mobile machine shop truck, the hand tools were stored in recessed wooden drawers, similar to those in the electric repair truck. These hand tools included such types as pullers, valve refacers, body repair tools, punches, and wrenches. While the hand tools did not consist of a large variety of different classes of tools, they did include a large assortment within certain categories. As an example, expansion reamers covered sizes from 4 mm to 52 mm. In some cases extra sets of taps and dies were calibrated in inches rather than in millimeters. This apparently was to take care of equipment the Nazis expected to capture from our forces. All micrometers were missing from this truck.

An extract from a report from the North African Theater of Operations states "...of particular note are the quantities of precision instruments (gages, star gages, micrometers, etc.) which are made available as standard equipment (in German mobile shops), and the arrangement of all tools and parts drawers to provide fitting compartments for each type and kind of item. Also highly worthy of note are the chests provided for each type of weapon, containing special tools and small spare parts. Another thing that caught attention is the locked compartment for tools for the maintenance of the vehicle itself, providing fitted drawers for the tools and including spare spark plugs, fuzes, and other small emergency items..."

Lists of equipment and maintenance manuals were found in the electric repair truck and also in the machine shop truck. These lists are now being translated for further study.

In general, the pattern of the German mobile shop trucks follows that of the United States Army mobile shops.

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15. GERMAN AT GRENADE RIFLE

The Germans have converted their Model 39 antitank rifle Pz.B.39,* (see MIS Special Series No. 14, May 25, 1943 German Infantry Weapons p. 34) into a weapon for firing the rifle grenade. The new rifle is called Granatbuchse 39, with "Gr. B. 39" on a plate fastened over the original Pz. B. 39 stamped on the receiver.

a. Description of the Modified AT Rifle

It is an adaptation of the German antitank rifle, Model 39, fitted with a cup grenade-launcher of the usual design, but the rifle is altered by the following modifications:

(1) The barrel has been shortened, and the carrying-handle moved to the rear
(2) The bipod, of the usual design but fitted with extended legs, is attached to the rear of the barrel
(3) The butt is laterally offset and strengthened by the insertion of a welded cross-member and is no longer able to be folded
(4) A special sight is attached to the left of the receiver. The front sight is in the form of a frame fitted with cross wires, and graduated from 0 to 150 meters. The rear sight is a notched bar (see sketch).
(5) Weight complete. . . . . 23.15 lbs
(6) Total length overall. . . . . 4 ft 3/16 in
(7) Total length of barrel . . . . 23 1/4 in
(8) Breech chamber. . . . . 4 5/16 in

b. Ammunition Fired

The three types of ammunition used are the same as those designed for the rifle grenade, (see Tactical and Technical Trends No. 36, p. 34). There is an antipersonnel, HE grenade weighing nine ounces, known as G. Spgr (Gewehr Sprenggranate); an AP grenade (Gewehr Panzergranate), abbreviated G. Pzgr, and the heavy AP grenade, both hollow charges, (Grosser Gewehr Panzergranate) Gr.G.Pzgr. While undoubtedly the antipersonnel grenade can be fired, it would be an unusual munition for an antitank rifle. The normal ammunition would be the AP grenade--the ordinary 8.8 oz Gewehr Panzergranate and the heavy, Grosser Gewehr Panzergranate. The latter is capable of piercing about two inches of armor.

These grenades are packed with the suitable blank cartridge for each type, in black containers with a white spot on the end for the AP grenades and a gray, for the HE. These blank cartridges are not interchangeable between different types of grenades.

According to one German authority, the heavy AP grenade has a range of about 100 meters, and according to another, 136. There may be two propelling cartridges. The range of the light AP is stated as 250 yards. In using the grenade

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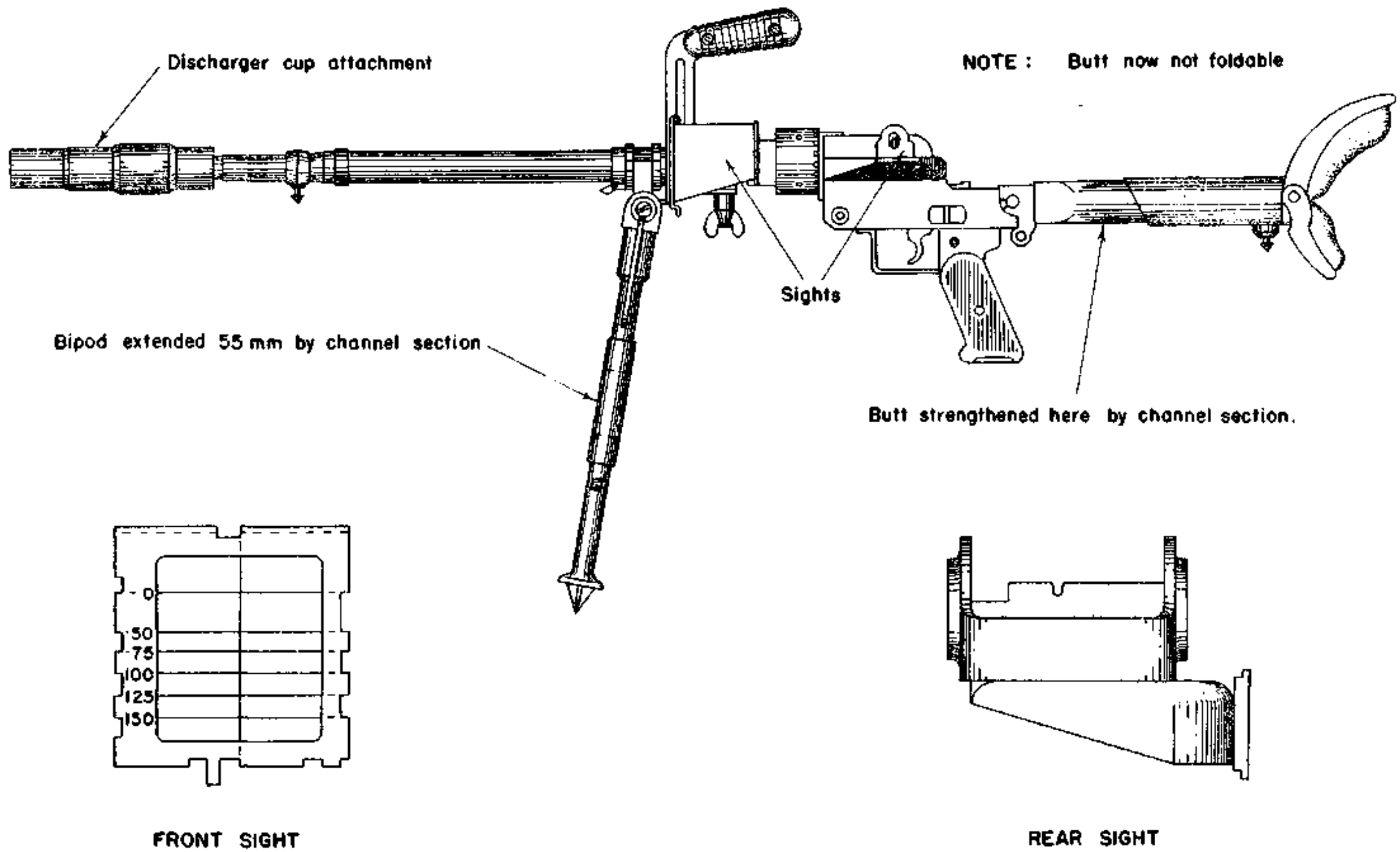
*Panzerbuchse - antitank rifle



GERMAN 7.92-MM AT RIFLE

(MODIFIED FOR GRENADE DISCHARGER)

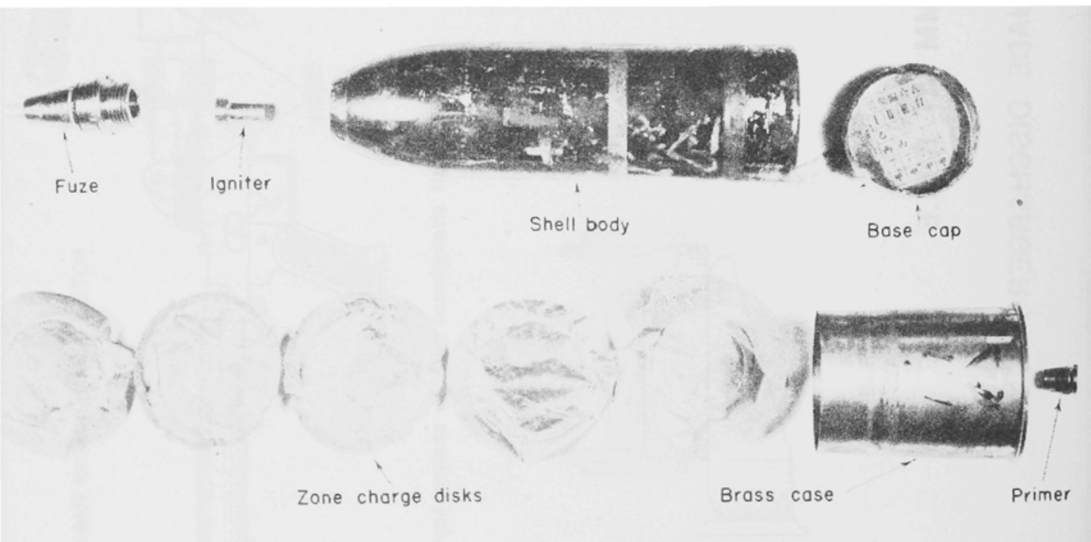
sights on the AT rifle with the heavy grenade, 125 meters on the sight corresponds to a range of 100 meters and 100 meters to 75.

16. JAPANESE 70-MM HOWITZER AMMUNITION

Since publishing the account of the Japanese infantry battalion howitzer, type 92, Mod. 1932 (see Tactical and Technical Trends p. 7 No. 34) data have come in from the Aberdeen Proving Ground concerning the ammunition. The more significant points in the report follow.

a. General

This ammunition is semi-fixed, has a HE projectile with a point-detonating, instantaneous, percussion fuze, and a brass cartridge case which has one igniter charge with four zone charges. These charges are disks contained in what appears to be oil-cloth. The igniter disk wrapper is light blue in color and those of the other four zone charge disks are dark blue. The brass cartridge case contains a screwed-in percussion primer. This primer was found to be interchangeable in the Jap 37-mm, 70-mm and 75-mm field gun ammunition, and is possibly used in other Japanese artillery ammunition.



JAPANESE 70-MM HOWITZER HE SHELL

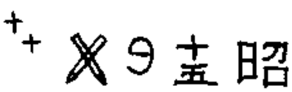
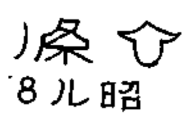
b. Details

The following characteristic data were obtained by examining one round of this ammunition.

[redacted]

Weight of complete round	9 lbs 8 oz
Weight of projectile	8 lbs 5 oz
Weight of detonator	Not known
Weight of picric acid booster	1.54 oz
Weight of TNT bursting charge	1 lb 1 oz
Weight of propellant	Not known
Weight of cartridge case w/primer	1 lb 3 oz
Overall length of complete round	14.36 in
Length of projectile w/fuze	11.47 in
Length of projectile w/o fuze	9.21 in
Length of cartridge case	3.94 in
Diameter of bourrelet *	2.744 in
Diameter of copper rotating band	2.803 in
Diameter of neck of cartridge case	2.806 in
Diameter of base of cartridge case	3.948 in
Diameter of base of percussion primer	.628 in

c. Color and Marking — Location

Color and Marking	Location
(1) Yellow band	Stenciled around body of projectile approx. 2 in, above rotating band 3/8 in wide
(2) Main body of projectile painted black	Projectile body above and below rotating band
(3) Other markings indecipherable	Stenciled in white approx. 1 inch in height on side of projectile between rotating band and yellow band
(4) Yellow label	A yellow label was pasted on cardboard disk used as a stopper for the powder charges in the cartridge case, marked in undecipherable Japanese characters.
(5)  **	Stenciled on base of cartridge case were the characters shown on opposite side.
(6) 	Stenciled on base of primer were the characters shown on opposite side; 1st line, undecipherable, 2nd line, August? 19?.

Comment: From the brief examination given this ammunition, nothing was found to be unusual or unique. The small amount of propellant would indicate the weapon has a very low muzzle velocity. According to W.D. Technical Manual 30-480, the maximum velocity is 850 f/s.

*Greatest diameter at head of shell.

**September 1940 with arsenal stamp.

[redacted]

GENERAL

17. DEFENSE OF POPULATED PLACES

Emphasis on the vital importance of inspiring efficient leadership, and understanding of troop psychology, and a discussion of tactical principles, feature a recent German document concerning the defense of populated places. The following article is a translation of the document, which was written by an officer serving on the eastern front.

* * *

a. The Leader

The leader is the soul of the defense. The fighting power, strength of the defense, and the spirit of the unit depend entirely on the leader. The leader, in turn, depends entirely on his men.

The defense of a town can only be directed from the town itself. It is nonsensical to attempt to direct the defense of a town from the rear. The leader must breathe the same air, take part in the same combat phases, as the common soldier. The leader must possess energy and must perform his mission with undaunted fanaticism. He must be able to act on the spur of the moment. Better to do the wrong thing once in a while than to act too late. He must be filled with optimism. He must be young and alert--there are young leaders who are 50 years old. Ruthlessness and hardness are always necessary. Yet the leader must feel for his men. Cold, rational beings will never be able to inspire enthusiasm, among the men. The leader must be able to give orders and state his intentions clearly and concisely.

Overcoming fear is the greatest victory man can gain. Some fear is inherent in every human being; the leader, too, cannot free himself from it. Even in desperate situations, the leader must be able to force weak men to stick it out. He who runs away will be shot. He who weakens must roughly be barked at. Better to beat up a weakling and thus save the situation than to lose the fight.

b. The Men

As troops engaged in the defense of a town are usually a mixture of several units, they do not possess the combat efficiency of a closely knit group. Leading such troops is a most difficult task. It is therefore necessary to form small groups and appoint sub-leaders. Sectors and boundaries must be clearly defined. An all-round defense must be planned. The leader in each sector must be thoroughly aware of the great responsibility resting on him. Every opportunity must be seized to instruct the men, to question them about their mission, to strengthen their self-confidence and to inform the sub-leaders about the situation. Every man must know the intentions of the leader. The men must believe in their invincibility and every one feel that he is stronger than 100 attacking Russians.

Men must be freed from the tank phobia. The men inside the tank are only human beings, who are just as frightened as the defenders, if not more so. The soldier must know that individual tanks are helpless in a town. Don't hesitate, therefore, to let such tanks pass through the lines. Tanks in motion don't hurt anything.

The soldier should be familiar with every possible situation and with the methods for defense in each case. His optimism must be refreshed time and again. Occasionally the leader might even start a good latrine rumor. The effecient functioning of the guard reliefs and provision for rest, warmth and food is vital.

c. The Position

Wherever possible, reverse slope positions which cannot come under enemy observation should be selected and scouting patrols for combat reconnaissance continuously sent out. During the frost, snow forts can be built. (See Tactical and Technical Trends No. 22 p. 20) Defenders should remain close to warm places; and should not hesitate to leave unoccupied a seemingly important hill if it is fairly distant. Small, narrow antitank foxholes should be dug on the outskirts of the town, as in cases of artillery fire, buildings are mantraps. The heavy weapons should be ready for action. Areas not covered by antitank guns must be closed by minefields and covered by fire. Reserves of ammunition and food must be accumulated, cattle and food-stuffs protected, and dogs shot. Attached artillery will usually have to learn how to fight in far advanced positions. Provision for early evacuation of wounded is necessary.

d. Antiaircraft

Russian low-flying attacks are usually ineffective. This is true also of their bombing attacks. Thus, everybody is to go under cover and only one light machine gun and one squad will remain to fire on planes.

e. Antitank Combat

Tanks usually move slowly through towns, fearing minefields and unexpected obstacles. Tanks are fought with AT and incendiary charges, with mud thrown against the slit, and by using every other means. At night, the field of fire may be lighted with flames and concentrated fire directed on the tanks. Each soldier must know the tank's weak points, what weapons it carries, where it cannot fire. Tanks that have lost their mobility are still in fighting trim. It is necessary, therefore, to blow them up or to fight them until they burn. Experience teaches that the Russians use "destroyed" tanks for artillery observation posts or as machine-gun emplacements; therefore from time to time such tanks in front of our own position should be fired on.

f. Use of Assault Guns

The self-propelled assault gun is an outstanding and much-feared weapon.

[redacted]

It is especially well suited for house-to-house fighting against an enemy who has broken through. Do not let assault guns fight against heavy Russian tanks since the assault gun's armor is too weak.

g. Signal Connections

At least one wire connection must be functioning at all times. Therefore, several must be laid and checked constantly. Radio equipment and batteries must be ready for immediate use. Whenever conditions permit, transmission may be in the clear.

h. Lighting

Lighting facilities are needed to enable the men to find their weapons and equipment without delay at night.

i. Water

Drinking water must be boiled, and tea prepared for the guards whenever it is possible to do so.

j. Barrage Fire

Exact barrage areas for mortars and infantry guns must be established and heavy machine guns sited to give flank protection to reverse slope positions. Hills can be combed with heavy machine guns and 20-mm AA. An advance observer, with a radio connection, should be constantly in the front line.

k. Care of Weapons

Weapons are inspected constantly to see that all are ready for action. Weapons "sweat" when taken into warm rooms; they should be dried at once. Oil or grease can not be used during freezing weather as such lubricants freeze and cause jams; petroleum or a gasoline-petroleum mixture is preferable. Machine-gun ammunition belts must be kept filled and in good order.

l. Conduct of Fighting

If the enemy penetrates a town at night, he must be cut off at daybreak and driven out with bunches of grenades and single hand grenades. Dominating hills are to be held by the smallest possible number of men, and in reverse slope position, in order to avoid unnecessary large losses. Massed Russian infantry attacks will be affected by organized hurrah-shouting by our own troops. This strengthens our own morale and confuses the enemy.

m. Conclusion

The focal point in winter fighting for a town is the town itself, since it is the center of warmth. It is much more effective to concentrate on the defense of

[redacted]

the town and a few hills nearby, or on the defense of the town only, than to scatter one's forces by occupying hills far off. In the event of a strong attack it will not be possible to send prompt support to these hills.

If the town should be entirely surrounded it will be the duty of the leader to continue the defense as before. The enemy will have to depart sometime. Since he will freeze to death, he cannot camp in the open for an indefinite period in order to keep the town cut off. An enemy who has been beaten off repeatedly will become cautious and hesitating. Relief will arrive eventually. Only mind and will power will triumph over any weapon.

18. GERMAN CURRENCIES IN OCCUPIED COUNTRIES

With Allied occupation of European countries in its first stages, the monetary problem is one which must be met. Some years ago, the Germans considered this situation, and perhaps their experience may be of value.

a. The Problem

German occupation of foreign countries has given rise to four different sets of difficulties in the field of finance.

(1) The collapse of the currency of the invaded country;
(2) Prevention of over-extension of the circulation of German national money - the Reichsmark;
(3) The re-establishment of local currency, (a) in Russia, (b) in capitalistic countries;
(4) Provision for an army currency that could be used by the troops, anywhere that German troops might be. In addition, it was desirable from the German viewpoint, to extract from the occupied territories as much gold and silver that they could seize to support the German domestic currency, and to prevent an inflationary price rise in the occupied countries which would add to German difficulties.

b. Rejected Solutions

At first glance, it might have seemed the simplest solution to sweep away all national currencies, and replace them with one general central European issue controlled by the Reichsbank. This obvious solution, however, was open to objection, as the financial status of the occupied or conquered nations varied greatly -- for example wealthy Holland and poverty stricken Croatia; moreover, the degree of punishment meted out to conquered peoples differed from one another. Poland and Greece are being wiped out; Holland, Luxemburg, Denmark and others will, if possible, be incorporated into the Reich. Therefore no attempt has yet been made to establish a general currency. Finally, to have extended the use of the Reichsmark into conquered countries, another apparently natural step, would have placed German national currency, physically, in the hands of people who were enemies of the Reich.

[redacted]

c. The Solution Adopted

(1) Reichskreditkassen (Reich Credit Offices)

One of the most interesting German innovations in this war was the development of special itinerant banks of issue to follow the invading German columns and establish themselves in the principal cities in the occupied areas.

These banks, the so-called Reichskreditkassen (Reich Credit Offices), were introduced in the Polish campaign, where they worked in particularly close conjunction with the army. On the basis of the Polish experience, certain administrative modifications of the system were made by the decree of 3 May 1940.

A council of administration for the Reichskreditkassen was established at that time with representation from the Reichsbank, the Finance Ministry, the Economics Ministry, the Oberkommando, and the Commander-in-Chief of the army. The Reichsbank provided the greater part of the personnel of the new Reichskreditkassen and maintained close administrative and technical connections with them. The head offices were maintained in Berlin, affiliated to the Reichsbank.

(2) Special Currency - Reichskreditcassenscheine

The Reichskreditkassen were responsible for the issuance of special notes (Reichskreditkassenscheine) to the armed forces in occupied areas. The notes, which were issued in denominations of 1, 2, 5, 20, and 50 marks, were legal tender only in the country in which they were issued and were not negotiable in other occupied territories or the Reich.

The rate of exchange between the RKK-scheine and the currency of the occupied country was fixed by the occupation authorities immediately after the entry of the army. The local banks were required to accept the notes at the official rate. The use of ordinary German banknotes by the troops was strictly forbidden, except in those areas such as Danzig, the Polish Corridor, Alsace and Lorraine which were officially or unofficially incorporated into the Reich.

The RKK-scheine were designed to place the entire burden of the occupation on the country in which they were issued and to prevent any indirect drain on German stocks or diversion of German production arising from an unrestricted filtering-back of notes into the Reich. In addition, it was anticipated that the influx of the notes into circulation would alleviate the temporary shortage of local currency resulting from panic hoarding and the exodus of refugees from the area. This proved to be the case, particularly in Poland and Belgium, where the central banks followed the established governments into exile and took the note supply with them.

The issuance of RKK-scheine was considered a temporary expedient and resorted to only for the payment of troops and for the purchase of minor supplies locally. The actual distribution of the RKK-scheine among the troops was left to the regular army paymasters, who were issued the currency in advance. The

[redacted]

technical personnel of the Reich Credit Offices was concerned instead, with extending emergency banking facilities to areas in which the normal monetary and credit facilities had been disrupted by the occupation.

(3) Reich Credit Offices -- Banking Operation

The Reich Credit Offices were authorized to function as credit institutions in occupied areas and carry out a wide variety of transactions. This was deemed necessary to ensure that the German forces would not be hampered by an internal credit crisis in the occupied area. The offices were permitted to invest in commercial bills, drafts, and secured advances of a maximum term of six months; to take non-interest bearing deposits; to hold deposits of securities and other objects of value; to carry on all types of banking operations, other than the acceptances business; and to regulate the general flow of money and credit within the occupied territories.

The scope and length of activity of the Credit Offices subsequent to the early stages of occupation depended upon local developments. In those areas which were incorporated promptly and completely into the Reich, the respective offices of the Reichskreditkassen became branches of the Reichsbank, which proceeded to take over their assets and liabilities.

In those countries which were stripped of normal monetary and banking apparatus by the destruction of records and evacuation of essential banks, the RKK constituted the nuclei for the establishment of new banks of issue. This took place in Poland, Belgium, and Yugoslavia.

In those areas in which the pre-invasion monetary and banking structure was left relatively intact, the emergency functions of the RKK were gradually reabsorbed by the existing statutory central banks.

In all cases, as soon as the occupation was consolidated and the Germans arrived at a satisfactory agreement with the existing central banks or established a new central bank, the issue of RKK-scheine was suspended. Thenceforth occupation troops were paid in local currency made available through the local central bank out of "occupation costs". Disbursements were through the regular military channels. RKK-scheine promptly disappeared from circulation, being taken in exchange against local currency by the central bank for the account of the Treasury of the occupied state.

The RKK-scheine system as utilized in the 1940 campaigns continued without major modification until mid-1942, when a new type of special currency, Wehrmachtbehelfsgeld or "Armed-forces-auxiliary money" was developed.

This auxiliary money was the solution adopted to handle the situation in certain friendly countries in which the issue of local currency sufficient to cover the soldiers' pay would seriously disturb the local finances. The first expedient adopted was to issue special "canteen-money" as part-payment of German troops in Rumania and Bulgaria. This "canteen-money" was valid only in military canteens,

[redacted]

soldiers' hostels, and similar service organizations.

Later the issue of armed-forces-auxiliary money was begun in Bulgaria. It consists of a new type of 1, 5, 10, and 50 pfennig notes issued by the Reichskreditkassen. The notes are issued for internal army purposes, where they are worth 10 times their "face" value. Outside the army organization they are worth only face value, which eliminates the danger of their being put into wide circulation. The auxiliary money differs from the "canteen-money" in that it can be used by the soldier, without loss, for savings or sending home to his family.

Under the present system, the RKK-scheine are kept in reserve for emergency use, mainly to provide a currency in areas in which fighting is actually in progress. In order that their issue can be accomplished without preliminary formalities should the occasion arise, they have remained legal tender in the occupied countries although they have de facto been withdrawn from circulation.

SECTION II

JAPANESE DEFENSE OF A CORAL ISLAND

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JAPANESE DEFENSE OF A CORAL ISLAND

The vastness of the Pacific with its multitudinous small islands presents many problems of defense. The following article is based on excerpts from a translated Japanese tactical treatise involving a study of the dispositions to be made for the defense of a hypothetical coral island. The study contemplates the utilization of field fortifications when landing operations are threatened by an enemy who is superior in air and sea power. There are many points which are not covered in this article, but it is being published as it is, in the hope that it will be of some value.

* * *

a. General

The organization and establishment of positions differs depending on the size of the island, the garrison's forces, weapons, and materiel, the situation of beaches where it is possible for the enemy to land, and many other factors. However, in case the strength of the garrison is comparatively small in relation to the size of the island, if an attempt is made to defend the island by stationing troops all around the shore line, the defense will be weak everywhere. Therefore, it is best to organize defense areas at important places so as to hold securely the important installations, with a large force being held in reserve. The intervals between defense areas should be covered by fire and obstacles should be constructed in these intervals. If necessary, small supporting points between the main defensive areas may be occupied with a part of the forces.

For obstacles within the island, it is necessary to select types of obstacles which will not show in aerial photographs so that the enemy cannot determine our dispositions for defense.

The plan of defense should be to destroy the enemy at the water's edge, but should he land, he will be annihilated by counterattacks.

b. Garrison of Defense Areas

The garrison of the defense areas differs, depending upon the mission, the size of the area occupied, and other considerations. However, on a coral island, ordinarily from one to two companies are necessary for the garrison of a defense area. The frontage assigned varies according to the type, number, etc. of the weapons which are to be located in the defense area, but if two platoons are placed on the front line, one company would be able to hold a front of 550 meters*. If the interval between platoons is covered by the coordinated fire of heavy machine guns from the platoon areas (the interval between platoons being 500 to 600 meters),

*To convert meters to yards add roughly 10 percent to the number of meters.

[redacted]

the frontage assigned to a company may be about 1,000 meters. The depth is about 150 meters for the platoon and about 400 meters for the company.

c. Method of Determining Frontage

The frontage assigned to the various units is determined by using density of fire as the standard.

(1) Conditions

Density of fire required for stopping an attack dead--5 shots on one meter of front every minute. Minimum limit of density of fire--3 shots on one meter front every minute. (These include rifle, LMG, and MG).

Rate of fire--rifle (10 shots per minute)
--LMG (150 shots per minute)

The heavy machine gun is used for flank defense. On the front, rifles, LMGs, etc., are used according to a fixed plan, or to fire at will on important targets. The degree of density, however, in each sector is not calculated.

(2) Frontages Covered by Various Units

(a) Squad front covered =50 to 90 meters

11 rifles firing 10 rounds per minute	= 110 rounds per minute
1 LMG firing 150 rounds per minute	= 150 rounds per minute
Total	= 260 rounds per minute
260 divided by 5 shots per meter per minute	= 50 meters
260 divided by 3 shots per meter per minute	= 90 meters

Therefore, 50 to 90 meters frontage.

(b) Platoon front covered =200 to 300 meters

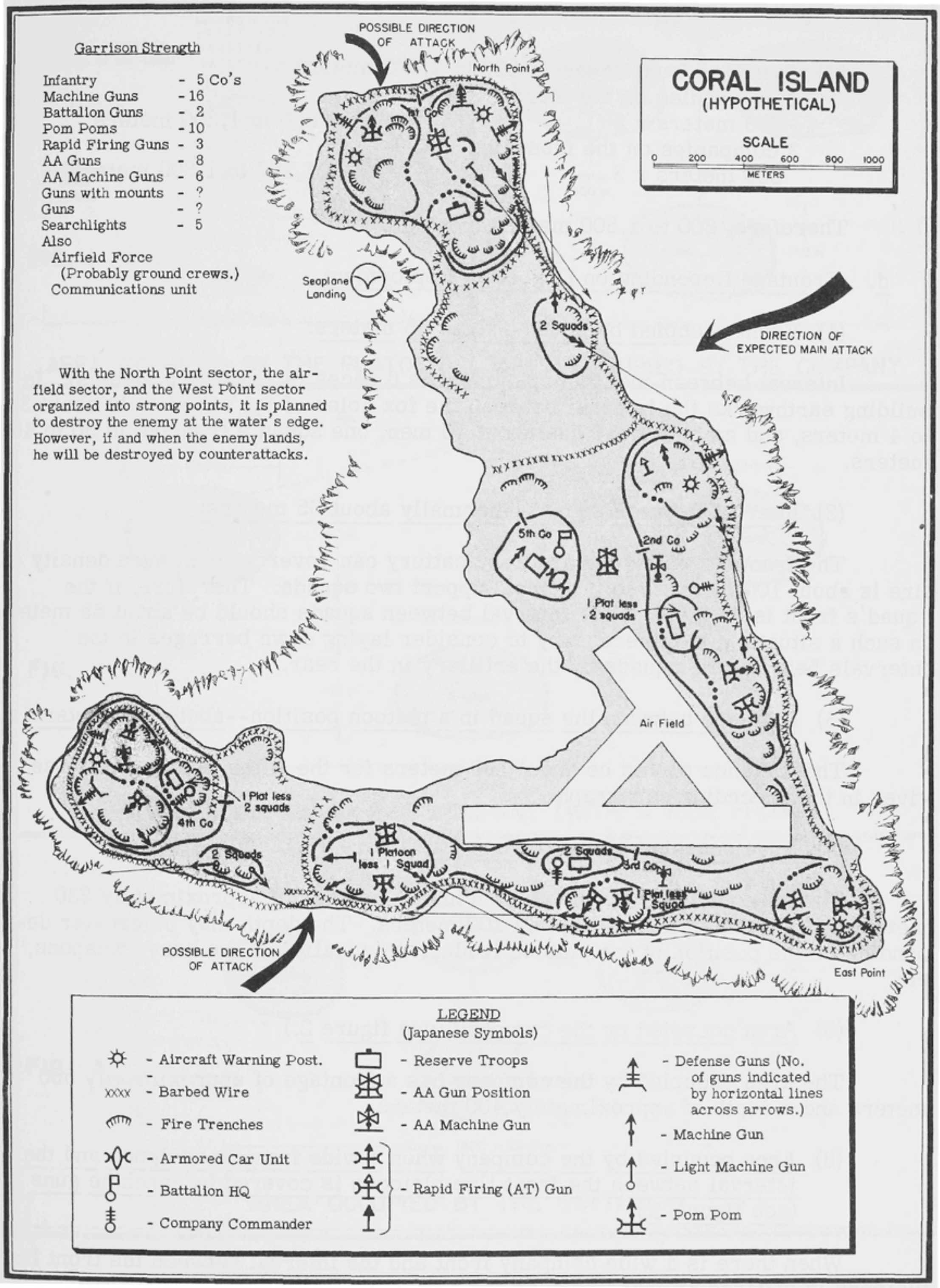
3 rifle squads on front line - 50 x 3	= 150 meters
90 x 3	= 270 meters
With heavy grenade squads on front line	= 200 to 300 meters

(c) Company front covered =400 to 600 meters

Two platoons on front line - 200 x 2	= 400 meters
300 x 2	= 600 meters

Therefore, 400 to 600 meters frontage.

[redacted]



Garrison Strength
Infantry - 5 Co's
Machine Guns - 16
Battalion Guns - 2
Pom Poms - 10
Rapid Firing Guns - 3
AA Guns - 8
AA Machine Guns - 6
Guns with mounts - ?
Guns - ?
Searchlights - 5
Also
Airfield Force
(Probably ground crews.)
Communications unit
POSSIBLE DIRECTION OF ATTACK
North Point
CORAL ISLAND
(HYPOTHETICAL)
SCALE
0 200 400 600 800 1000
METERS
1st Co
Seaplane Landing
2 Squads
DIRECTION OF EXPECTED MAIN ATTACK
With the North Point sector, the airfield sector, and the West Point sector organized into strong points, it is planned to destroy the enemy at the water's edge. However, if and when the enemy lands, he will be destroyed by counterattacks.
5th Co
2nd Co
1 Plat less 2 squads
Air Field
1 Plat less 2 squads
4th Co
2 Squads
1 Platoon less 1 Squad
2 Squads
3rd Co
1 Plat less 1 Squad
POSSIBLE DIRECTION OF ATTACK
East Point
LEGEND
(Japanese Symbols)
- Aircraft Warning Post.
xxxx - Barbed Wire
- Fire Trenches
- Armored Car Unit
- Battalion HQ
- Company Commander
- Reserve Troops
- AA Gun Position
- AA Machine Gun
- Rapid Firing (AT) Gun
- Defense Guns (No. of guns indicated by horizontal lines across arrows.)
- Machine Gun
- Light Machine Gun
- Pom Pom

[redacted]

(d) Battalion front covered =800 to 1,800 meters

2 companies on the front line - 400-600 meters x 2	= 800 to 1,200 meters
3 companies on the front line - 400-600 meters x 3	= 1,200 to 1,800 meters

Therefore, 800 to 1,800 meters frontage.

d. Frontage Depending on Degree of Deployment

(1) Front occupied by squad--about 35 meters:

Interval between men in deployment is 6 paces (about 4 to 5 meters). In building earthworks the interval between the fox holes of the riflemen is about 3 to 4 meters, and as one squad has about 10 men, one squad's frontage is 30 to 40 meters.

(2) Interval between squads--normally about 65 meters:

The frontage which one artillery battery can cover with an even density of fire is about 100 meters, so it cannot support two squads. Therefore, if the squad's front is 35 meters, the interval between squads should be about 65 meters. In such a situation, it is necessary to consider laying down barrages in the intervals between the squads by the artillery in the rear.

(3) Distance between the squad in a platoon position--about 100 meters:

The distance should be about 100 meters for the same reasons as those given in the preceding paragraph.

(4) Area occupied by the platoon (see figure 1.)

The area occupied by the platoon has a frontage of approximately 230 meters and a depth of approximately 100 meters. The depth may be greater depending on the position of the platoon leader, the location of the heavy weapons, etc.

(5) Area occupied by the company (see figure 2.)

The area occupied by the company has a frontage of approximately 550 meters and a depth of approximately 400 meters.

(6) Area occupied by the company when a wide front is assigned and the interval between the front line platoons is covered by machine guns (see figure 3.)

When there is a wide company front and the interval between the front line platoons is covered by machine guns the company frontage will be approximately 1,000 meters and the depth approximately 400 meters.

[redacted]

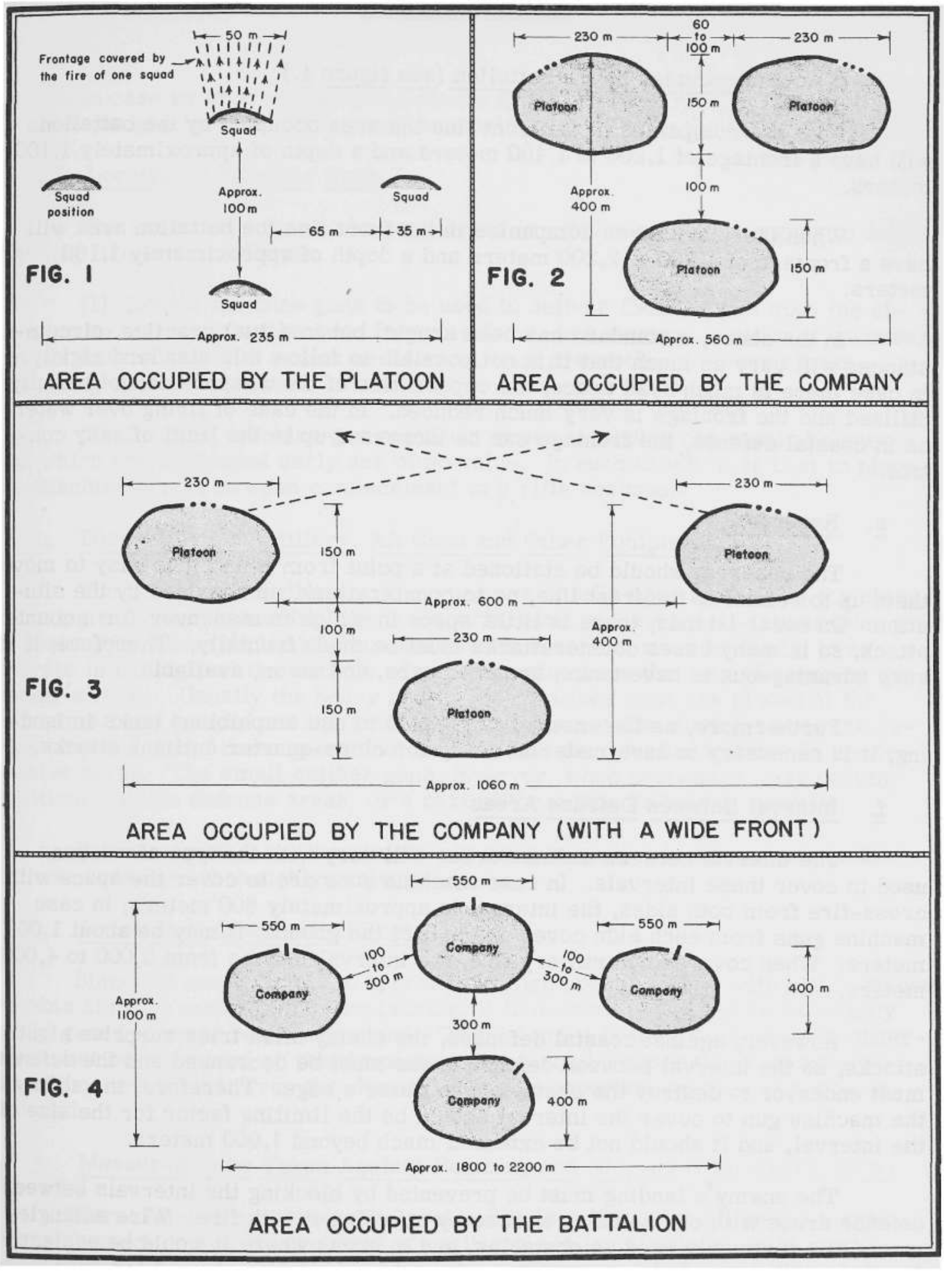


FIG. 1
50 m
Frontage covered by the fire of one squad
Squad
Squad position
Approx. 100 m
Squad
65 m
35 m
Squad
Approx. 235 m
AREA OCCUPIED BY THE PLATOON
FIG. 2
230 m
60 to 100 m
230 m
Platoon
150 m
Platoon
Approx. 400 m
100 m
Platoon
150 m
Approx. 560 m
AREA OCCUPIED BY THE COMPANY
FIG. 3
230 m
230 m
Platoon
150 m
Platoon
Approx. 600 m
100 m
Approx. 400 m
230 m
150 m
Platoon
Approx. 1060 m
AREA OCCUPIED BY THE COMPANY (WITH A WIDE FRONT)
FIG. 4
550 m
550 m
550 m
Approx. 1100 m
Company
100 to 300 m
Company
100 to 300 m
Company
400 m
300 m
Company
400 m
Approx. 1800 to 2200 m
AREA OCCUPIED BY THE BATTALION

[redacted]

(7) Area occupied by the battalion (see figure 4.)

With two companies in the front line the area occupied by the battalion will have a frontage of 1,200 to 1,400 meters and a depth of approximately 1,100 meters.

When there are three companies in the front line the battalion area will have a frontage of 1,800 to 2,200 meters and a depth of approximately 1,100 meters.

In the above, a standard has been sought, but in actual practice, circumstances will vary so much that it is not possible to follow this standard rigidly. In case there is much dead space, the capabilities of the weapons cannot be fully utilized and the frontage is very much reduced. In the case of firing over water as in coastal defense, the frontage can be increased up to the limit of easy control.

e. Reserves

The reserves should be stationed at a point from which it is easy to move them up to reinforce the front line, or to counterattack, as required by the situation. On coral islands, there is little space in which to maneuver for a counterattack, so in many cases counterattacks must be made frontally. Therefore, it is very advantageous to have tanks, armored cars, and so on, available.

Furthermore, as the enemy has planned to use amphibious tanks in landing, it is necessary to have material ready for close-quarter antitank attacks.

f. Interval Between Defense Areas

The interval between defense areas will vary with the type of weapons used to cover these intervals. In case machine guns are to cover the space with cross-fire from both sides, the interval is approximately 600 meters; in case machine guns from each side cover one half of the ground, it may be about 1,000 meters. When covered by artillery fire, the interval may be from 2,000 to 4,000 meters.

However, against coastal defenses, the enemy often tries surprise night attacks, so the interval between defense areas must be decreased and the defenders must endeavor to destroy the enemy at the water's edge. Therefore, the ability of the machine gun to cover the interval should be the limiting factor for the size of the interval, and it should not be extended much beyond 1,000 meters.

The enemy's landing must be prevented by blocking the intervals between defense areas with obstacles as well as by covering it with fire. Wire entanglements are commonly used as obstacles, and in areas where it would be easiest for the enemy to land, wire entanglements and land mines are used together. Charged wire entanglements can be used effectively.

[redacted]

In case an interval between defense areas is very great, it is necessary to close the gap by organizing small support areas between the defense areas.

g. Location of Machine Guns

The essential points to be considered in emplacing machine guns to deliver flanking fire are as follows:

(1) Locate machine guns to be used to deliver flanking fire upon the attackers so that it cannot be seen from the front, in a covered position if necessary, and so that the loophole cannot be fired on, thus preventing the enemy from advancing upon the position.

(2) Covered machine-gun positions whose loopholes can easily be seen and which are destroyed early are of no value. In such cases, it is best to place the machine gun in an open emplacement in a rifle position.

h. Disposition of Artillery, AA Guns and Other Equipment

The heavy and medium caliber guns are chiefly used in shelling the ships covering the enemy's landing, the transports, etc., and the small caliber guns are to destroy the enemy's landing boats while off shore or, when he lands, to cooperate in the fight at the water's edge. They also have the duty of engaging the enemy's tanks. Usually the heavy and medium caliber guns are placed at the most important points, and the small caliber guns are distributed among the defense areas. All of these guns must be fully protected by the infantry in the defensive areas. The small caliber guns, however, when necessary, may occupy positions outside defense areas, or a part of them may be held in reserve.

It is essential that other important equipment also be placed within the defense areas and thoroughly protected.

i. Location of Observation Posts

Since the enemy plans to approach at high speed at night with highly maneuverable ships to make a surprise landing, it is necessary to keep an especially strict guard to avoid being surprised. To this end it is necessary that the observation net be organized so that important areas can be observed from several directions and so that even the comparatively unimportant areas will not be unwatched.

j. Measures to be Taken Against Bombing and Shelling from Enemy Ships

Coral islands are generally level and it is difficult to utilize the terrain for the protection and concealment of positions and installations. It is most necessary to use camouflage to conceal the positions and the disposition of weapons, etc., and to use dispersal to limit damage. Of course, it is to be expected that there will be strong, permanent installations built to stand up under shelling and bombing, but these cannot be built to meet an emergency. Ones which are strong

[redacted]

enough to be proof from bullets and shell fragments may be considered advantageous. Furthermore, the heavy weapons, etc., used for flank defense should have light covers; the other weapons should be uncovered, and completely camouflaged. At the same time reserve positions should be established and, emplacements for the weapons should be constructed near the position to prevent damage during shellings and bombing.

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WAR DEPARTMENT · · · WASHINGTON, D. C.

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SECTION I

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AIR UNCLASSIFIED

1. AIRCRAFT AGAINST TANKS

Lessons concerning the employment of aircraft against tanks, as learned by the Russians in the Orel-Kursk and Belgorod battles, were outlined in an article published recently in the Red Star. The article is reprinted herewith.

* * *

Our [Russian] aviation assists the ground forces by destroying tanks on the battlefield and in the enemy rear where other antitank means cannot be used. Activity of aircraft against tanks is particularly successful when the enemy sends large masses of tanks into battle, as was the case on the Orel-Kursk and Belgorod sectors.

Combat experience on both sectors showed that thorough and systematic aerial reconnaissance is of particular value in aiding aircraft in fighting tanks. At times, this type of reconnaissance is the only one that permits the detection of enemy concentrations of tanks. Air observation by aerial photograph must be made of areas of possible concentrations, especially on the flanks of our units. Survey of the vicinity (ravines, woods and its outskirts, branching roads, etc.) may be done by night as well as by day. Raids and bombings that make the enemy "speak up" and disclose well-camouflaged and concealed positions are very helpful.

In examining and collating aerial reconnaissance reports and photographs, the commander should not confine himself to verifying only the presence of tank concentrations. It is also necessary to determine the number of tanks, their different types, their arrangement, the location of fueling trucks, transports, available cover, and antiaircraft weapons.

Enemy tanks detected by reconnaissance may be attacked immediately or later, depending upon strategic conditions. Stormoviks give the best results; they should not, however, be used according to a wornout pattern, but as concrete conditions dictate, since definite conditions of fire (distance, direction, caliber of armor-piercing shells) are required in striking armored targets.

The fire of our Ilyushin-2 Stormoviks, which have large-caliber cannon, is effective against the main types of enemy tanks. The most advantageous attacking positions for aircraft are from the rear or the side of the tank; and when diving, at an angle of not more than 30 degrees. Cannon fire against cars and carriers with 10- to 14-mm armor usually is effective. The majority of German armored personnel carriers do not have tops and are furnished with low visors on the sides. Thus, when diving, even machine-gun fire of a Stormovik may destroy the personnel. Medium-caliber instantaneous bombs are most expedient against tanks. The hit can be either direct or in the immediate vicinity of the tank.

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Action against tanks should depend on the armament of the plane in relation to the targets' armor. Thus, large-caliber armament is used against tanks and other heavily armored targets; smaller caliber, against personnel and various supply equipment.

The method of attack depends upon the position of the target (tanks in columns, initial position, places of concentration, and in combat formation). For example, an attack on tanks in column should be from the rear and side. Since tanks, when moving, are spread out, each subdivision of Stormoviks should be given a definite target and should not be permitted to scatter their fire power. Some of the planes should be assigned to neutralize enemy antiaircraft fire.

In addition to the use of cannon fire, it is well to drop bombs when enemy tanks are found in places of concentration. At the same time, the commander should pay special attention to the disposition of enemy equipment including fuel and ammunition dumps.

Because of good armor protection, our Stormoviks may be used with success against enemy tanks on the battlefield. Combat experience indicates that the closed circle over the tanks is an advantageous formation to use. Since the targets are scattered, this formation gives each pilot the chance of picking out the target and of attacking it several times. The attack is made from the rear for the following reasons:

(1) It permits fire on the most vulnerable parts of the tank;
(2) The tanks are unable to counter our attacks, since their guns are pointed in the direction of our ground forces;
(3) In case of a hit made by antiaircraft guns, the plane may glide within its own lines.

Disabled tanks which the Germans dig into the ground and use as stationary fire points during defense operations should not be attacked by Stormoviks or fighters. The ground forces attack such tanks. The chief attention of the pilots should be devoted to mobile tanks and especially those that are out of antitank artillery range.

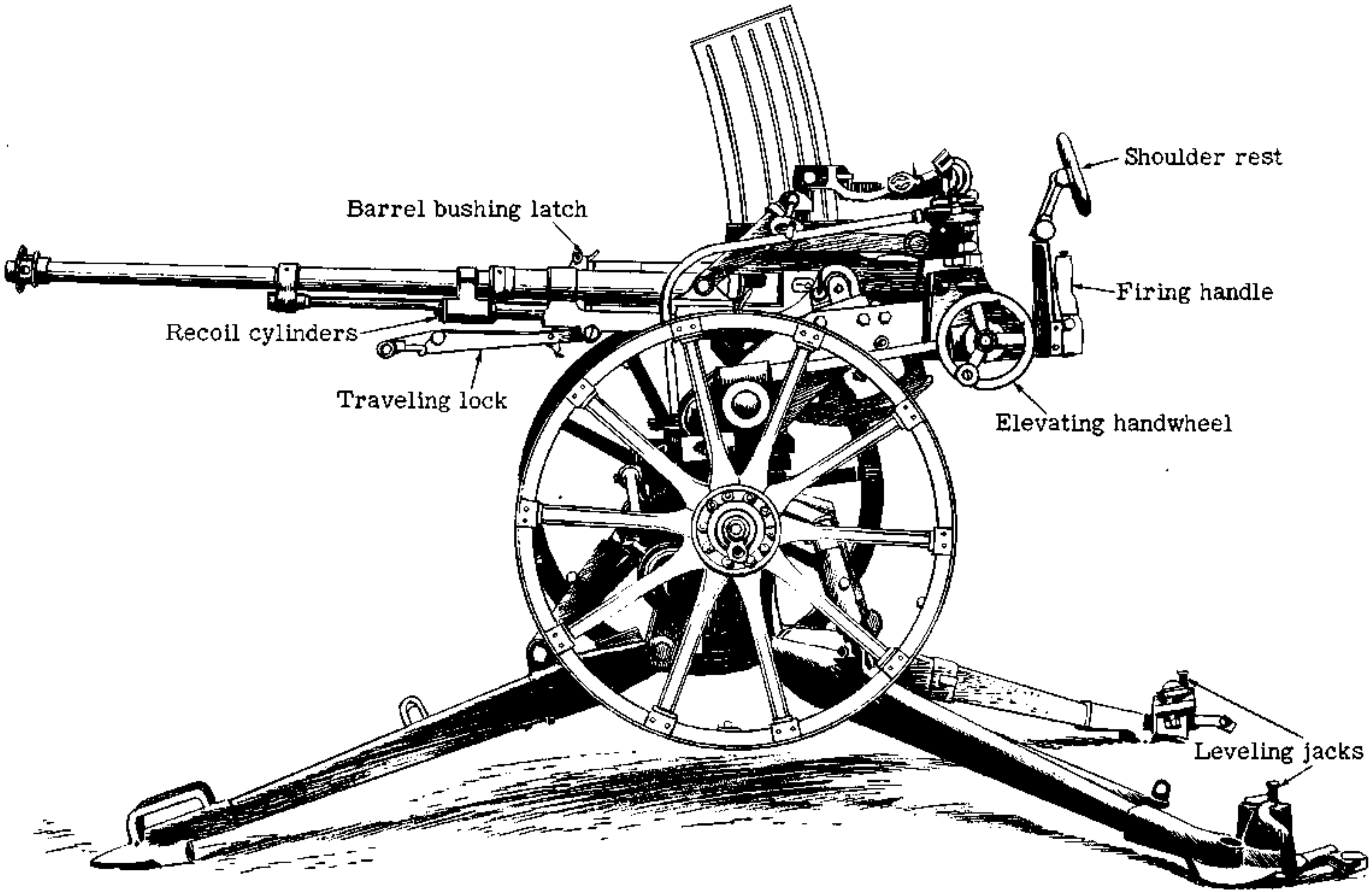
The success of a raid depends largely on how well the pilots know the different types of tanks and how well they can distinguish them from the air. It is also necessary to be able to fire with precision.

ANTIAIRCRAFT

2. JAPANESE AA/AT 20-MM MACHINE CANNON

The Japanese Model 98 (1938) 20-mm AA/AT machine cannon is a weapon of unusual appearance, but with many practical advantages. The following account of the gun has been taken from Special Series No. 18, "Japanese Infantry Weapons,"

[redacted]



JAPANESE 20-MM AA/AT MACHINE CANNON

which is in process of preparation by the Military Intelligence Division.

a. General

It is an all-purpose weapon. Because of its lightness in weight and maneuverability, it is an excellent gun for defense against low-flying bombers as well as against ground-strafing fighters. An experienced gun crew can probably place the piece in battery, ready for antiaircraft fire, in less than 3 minutes. In an emergency, the weapon could be fired as a straight artillery piece, because of its split trail and wooden wheels (see sketch).

b. Identification

The Model 98 20-mm AA/AT machine cannon may be identified by its general appearance. It is different from any other Japanese field piece, the front outrigger, the barrel traveling-lock and the marking which is on the top of the receiver are distinctive features.

九
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式

(This marking, which is read "Kyuhachi Shiki" from top to bottom, means "98 Model.")

c. Characteristics

(1) General. It is automatic and gas-operated. The cycle of operation is loading, locking, firing, unlocking, extracting and ejecting; unlocking, extracting, and ejecting are done during recoil; loading, locking, and firing in counter-recoil.

The recoil mechanism consists of two spring-loaded cylinders that lie one on each side of the barrel. Air valves, located in the forward ends of the cylinders, allow air to be drawn into the cylinders during recoil; as the air cannot readily escape, it acts as a cushion during counter-recoil.

There is a vertical box-type magazine--with a capacity of 20 rounds--which fits into a slot in the top of the receiver and is held in place by a spring catch.

For traveling, towing shafts are inserted in slots at the end of the trails, and a traveling lock, which connects the forward part of the barrel to the bottom carriage, holds the gun steady in transit.

(2) Details

Principle of operation	gas-operated, automatic or single shot
Ammunition	high explosive, tracer, and armor-piercing
Type of feed	20-round magazine
Length of barrel:	
With muzzle brake	57 1/2 in
Without muzzle brake	55 1/8 in
Over-all length of gun with trails folded	180 in
Total weight of gun without wheels	836 lbs
Maximum horizontal range	5,450 yds
Maximum vertical range	12,000 ft
Muzzle velocity	2,720 f/s
Traverse without wheels	360°
Maximum elevation	85°
Minimum elevation (depression)	-10°
Rate of fire	120 rpm
Length of recoil	adjustable from 2 in to 2.5 in

d. Operation

(1) Safety. There are two safety features; (a) the lock on the firing handle, to the left and rear of the gun, must be depressed before the handle can be moved forward; and (b) the manual safety mechanism, to the rear and upper right side of the receiver must be turned counterclockwise before the weapon can be fired.

(2) To place the gun in firing position: Set trails and outrigger in the ground. Swing the eccentric (crankshaped) axle so that the weapon is resting on the trails and outrigger, and the wheels are clear of the ground. Then the wheels can be removed by releasing the spring catches, which lock them to the axle.

(3) The elevating handwheel is at the left rear.

(4) To traverse. Traversing can be done by the gunner by putting his shoulder to the shoulder rest at the left rear of the weapon.

(5) To load. Place a loaded magazine into the slot on top of the receiver. The first round can be pushed into the chamber by pulling the handcharging lever into the rear and then forward. (The handcharging lever is at the right of the receiver.)

(6) To fire. Press the lock on the firing handle and move the firing handle forward. Automatic or single-shot fire may be chosen by moving the selector

switch at the right rear of the sleigh.

(7) To unload. If there is a misfired round in the chamber, pull back the handcharging lever in order to extract and eject the round.

e. Ammunition

There are two types of ammunition, high-explosive and armor-piercing.

(1) The high-explosive ammunition has an abnormally large brass cartridge case, and a black projectile body. A green and yellow band are painted together around the middle of the shell, and a red band just below the bourrelet.

The complete round weighs 14.5 ounces, and is 8.187 inches long. The brass nose fuze is point-detonating, bore-safe, and supersensitive. There is a tracer compound in the base of the shell.

(2) The complete armor-piercing round is 8.183 inches long. Both the high-explosive and the armor-piercing rounds are wrapped individually in cardboard containers. The armor-piercing ammunition is packed 70 rounds to a wooden box.

The fuzes for the high-explosive round are wax-dipped, covered with a metal cap, and paper-wrapped. The wrapped fuzes are packed between holes in boards mounted in an unlined crate, and shipped separate from the rest of the round.

f. Maintenance

(1) Oiling and cleaning. This gun should be given the same care as U.S. machine guns and automatic cannon. The bolt parts may be oiled lightly, except in dusty or sandy countries, and then not at all.

(2) Stripping: (a) The barrel is keyed to the receiver by a set screw. When this set screw is loosened, the barrel may be freed by releasing a latch on the rim of the barrel bushing, and turning the barrel about one-sixth of a turn. The gas cylinder yokes will come out with the barrel as one assembly. (b) Place the bolt in the forward position with the handcharging lever. Remove the receiver rear-plate assembly and slide the bolt out to the rear.

g. Accessories

There is a carrying case for the sight, also a small box containing a quantity of headspace washers. The ammunition is carried in a caisson which may be horse-drawn.

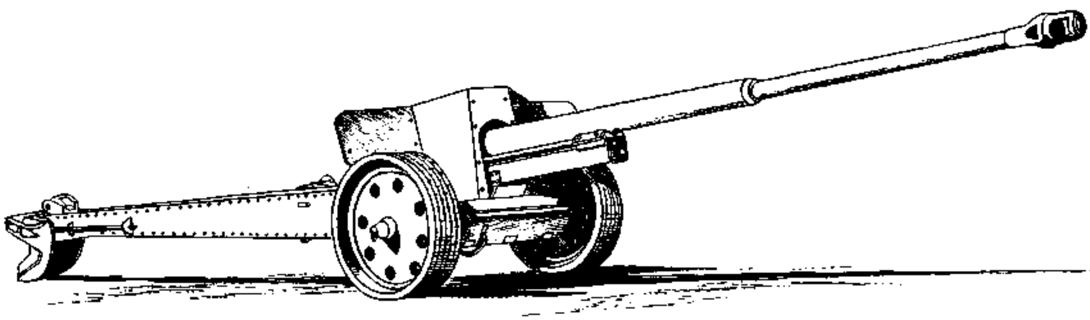
The sight-mount carrying case contains the following items: main part of apparatus, glasses, colored glasses, lighting apparatus, rain cover, small camel-hair cleaning brush, towel, oil-can and three brushes.

[redacted]

ANTITANK

3. NEW GERMAN 88-MM AT GUN

A photograph has been obtained of what is presumably a new AT gun. Although it is not possible to give accurate details of the weapon from the illustration, the barrel bears some superficial resemblance to that of the 8.8 cm Flak 41 (see Tactical and Technical Trends No. 29, p. 5) while the carriage shows considerable similarity with the mount which is interchangeable between the 105-mm gun (10.5-cm K-18) and the 150-mm medium field howitzer (15-cm s F.H.*), both standard equipment for the German infantry division. It seems probable, therefore, that the weapon is the Pak 43, which is believed to be the barrel and recoil assembly of the 8.8-cm Flak 41 on a field mounting for use principally as an antitank gun, with no AA role, and with which the name "Hornet" has been connected.



NEW GERMAN 88-MM ANTITANK GUN

The accompanying sketch has been made on the assumption that the barrel of the 8.8-cm Flak 41 fitted with a muzzle brake is, in fact, mounted on a modified carriage for the 105-mm gun and the 150-mm howitzer, with the addition of a low shield. It will be noted that the recoil cylinder and recuperator are now mounted below the barrel in accordance with the German antitank gun practice. In the sketch, the trails are shown as fitted with small ice spades and mount the large spade in the carrying position.

ARTILLERY

4. JAPANESE ARTILLERY IN THE ARAKAN

a. General

Actual contact with the enemy tends to dissipate the illusion of his power. This illusion is often present in the mind of a soldier until he has been in action. The following observations on Japanese artillery combat in the jungles of southwest Burma, drawn from a British officer's report, points up the foregoing conclusion.

* * *

*schwere Feldhaubitze-medium field howitzer

[redacted]

The outstanding fact about Japanese artillery in the latter part of the campaign was its inactivity. For the 30,000 shells fired at the enemy, he replied to this regiment with only some 400 rounds. These were mostly fired by 75-mm mountain guns. Moreover, the firing of his guns was such an event that regimental headquarters was always snowed under with requests for sound bearings, times of flight, etc., within a few moments of commencement of firing. To meet such requests, all compasses in the supported infantry brigade should always be calibrated by regimental headquarters as soon as possible. In some cases strenuous efforts on the part of the artillery were necessary to convince infantry battalions of the necessity of adding their own observations to those of the artillery. In other cases, infantry battalions seemed poorly equipped to do so.

Based on the many reports received, a fair amount of data was made available; this applied equally to the 75-mm mountain and 75-mm regimental gun, but <u>not</u> to the 70-mm battalion gun, of which little is known, apart from the fact that an artillery prisoner of war said it was useless.

<u>b</u>. <u>Specific Observations</u>

(1) <u>Tactical</u>. The gun is located often singly, with complete flash cover, (near regimental headquarters if a regimental gun), well off the beaten track. Most difficult to spot, it will always move if possible after firing. Usually its positions were out of range of the 3.7 howitzers, chosen if possible for the employment of extreme range.

(2) <u>Technical</u>. Registration will be carried out for some time before any particular target is engaged. Then usually only two ranging rounds suffice; however, more are sometimes required.

(3) <u>The Gun</u>. The Japanese piece was very accurate, with a 100% zone of about 50 yards at 7,000 yards using 50 rounds; crater, eighteen inches diameter, three inches deep; fragmentation, normal; concussion effect very small. The delay action, graze fuze, burst on small branches of trees. The angle of fall at 7,000 yards was about 38 degrees; the general effect of the shell was very small -- the sound of the burst of this gun was less than that of a 3.7 howitzer but quite like our own 2-inch mortar, while the rate of fire was very fast, up to 10 rounds per minute.

(4) <u>Deception</u>. One habit of the Japanese was noticed early in the campaign and frequently encountered afterwards. While our own artillery was firing on a close-in target, he opened up with his mortars on our own front line, timing his fire so that the burst of our shells and his bombs should be as nearly simultaneous as possible. Not only was our own attention apt to be distracted, thereby reducing the chances of his mortars being located, but also he obviously hoped (and on two occasions he temporarily succeeded) in making our own infantry believe that their casualties were being caused by short rounds from our own guns. [A similar deception has been reported from the North African operations.]

[redacted]

5. GERMAN 75-MM MOUNTAIN GUN

A preliminary examination of the German 75-mm Geb. G.36 (mountain gun) has been made and the following information obtained.

a. General

Caliber	75-mm
Length of barrel and breech ring	69.2 in
Length of barrel	58.0 in
Overall length of muzzle brake	12.32 in
Length of rifling	50.96 in
Rifling	Right hand polygroove
Number of grooves	28
Twist of rifling	1 in 24 uniform
Weight of barrel	233.2 lbs
Weight of barrel with breech ring top plate and breech mechanism	583 lbs
Weight of breech mechanism	68.2
Elevation	70° approx
Depression	-10° approx
Traverse	15° approx right and left

b. The Gun

Monobloc barrel fitted with perforated muzzle brake. The rear end of the piece is rectangular and fits into prepared recesses in the breech ring from which it is readily detachable. At the forward end is a binding ring with a lug which fits into a hook mounted on the cradle. A counterweight, weighing 114.4 pounds, is mounted on top of the breech ring. The breech block is of the horizontal sliding block type, opening to the right.

c. The Carriage

The saddle is shaped like a U lying sideways, prongs forward, and swings under the crosshead, being pivoted centrally. The trunnion bearings are at the extreme rear. The trunnion caps are secured by spring plungers. Traverse stops are fitted at the lower right and left rear.

The cradle is trough-shaped. A guideway extends the whole length on which a hook is mounted at the front, and at the rear, a rectangular surface to receive the forward end of the piece and breech ring respectively. A recoil indicator is fitted to the right side reading from 600 to 770, and inscribed Achtung Feuerpause 1244 (safety limit of recoil 1244 mm).

A compensator is fitted and consists of a spring-loaded cylinder situated inside the saddle. It is anchored at the forward end to the base of the saddle, and at the other end to the base of the cradle.

The crosshead consists of a rectangular shaft at each end of which are bearings to receive the trail heads. It is pivoted centrally in the vertical plane

[redacted]

to the axle and swings in slides secured to the axle at each end.

The axle is a simple straight rectangular shaft tapered at each end for the wheels. The wheels may be detached by lifting spring plungers which are situated at each end on top of the shaft.

The split trail consists of two hollow rectangular girders, prepared at the rear to receive spades, and mounted at the forward end in the bearings on the crosshead. Spring loaded plungers on top of the trail heads lock the trails in position when open. In the closed position they are locked by an arm attached to the rear of the left leg which is clamped to an attachment on the right leg by means of a rotating bolt. Two screw stops are mounted on the trail legs; when unscrewed these permit of approximately 2 degrees of traverse either way with the trail legs closed. The trail legs may be detached from the trail heads, on which they are normally locked, by means of a lever catch.

The elevating gear, on the right hand side, consists of a handwheel, universal joint, and two pinions, one of which engages with the elevating arc which is secured to the right of the cradle.

The traversing gear, on the left hand side, consists of a nut and screw device. The nut is enclosed in a cylinder attached at one end to the rear of the saddle, while the screw shaft is secured to the crosshead.

The recoil mechanism -- buffer and recuperator cylinders lie inside the cradle to the right and left respectively.

The sight bracket consists of a pillar secured to the left rear of the saddle with a trunnion at the top on which the sighting gear is mounted.

ARMORED

6. GERMAN FOUR-WHEELED ARMORED CARS

Four-wheeled armored vehicles used by the German army are of three main types, the Sd. Kfz (Sonder-Kraftfahrzeug)* 221, 222, and 223. (The eight-wheeled types are described in Tactical and Technical Trends p. 8, No. 32). Of these the 222 is the most common, the other two models varying slightly in weight, turret arrangement and armament. Model 222 is illustrated in the accompanying sketch. Principal differences between the three types are outlined below:

(a) Light armored car 222 (leichter Panzerspähwagen)

This carries a 2-cm. gun Kw.K 30 or Kw.K 38 mounted on a central pillar together with a coaxial 7.92-mm M.G.34 to the left and a telescopic sight for the

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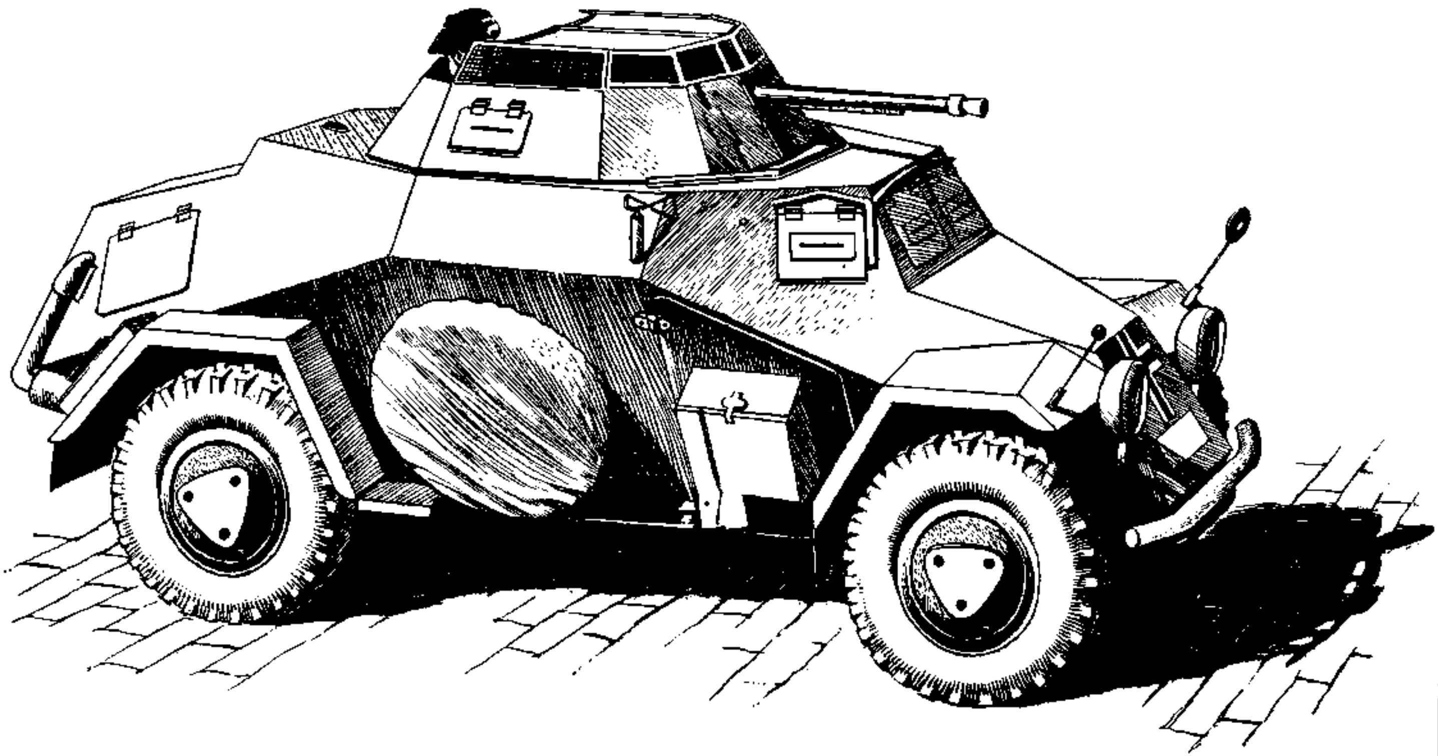
*Special motor vehicle

[redacted]



GERMAN 4-WHEELED ARMORED CAR, TYPE 222

[redacted]

gunner on the right. The firing mechanism is pedal-operated. Traverse and elevation are controlled by a single handwheel, and elevation is sufficient to permit of antiaircraft use. A submachine gun (M.P 38 or M.P 40) may also be carried. The car is equipped with a radio transmitter and receiver with a radius of about 4 1/2 miles. The turret is ten-sided, and its roof is fitted with two hinged frameworks covered with wire mesh which, in the closed position, together form a raised birdcage-cover over the roof of the turret, as a protection against grenades. There is a crew of three: commander-gunner, driver, and radio operator-loader.

(1) Specifications

Weight		
Unloaded		8,288 pounds
Loaded		10,528 pounds
Axle loading		
Front		4,480 pounds
Rear		8,176 pounds
Armor		Rolled armor plated, welded together
Turret		
Plate	Thickness (mm)	Angle to vertical
Front	8	35°
Sides	8	35°
Rear	9	35°
Hull		
Driver's plate	8	35°
Nose plate	8	35°
Sides (upper)	8	(30° front (35° center (32° rear
Sides (lower)	8	26°
Rear	8	34°
Glacis	6	72°
Engine cover plate	6	72°

Ammunition carried	20 mm -	100 rounds A.P. 120 rounds H.E.
	M.G.34 -	2,000 rounds
	Submachine gun M.P 38 or 40	up to 12 magazines, each holding 32 rounds.
Miscellaneous	8 smoke candles 8 hand grenades	
Sighting arrangements	T.Z.F.* 3 A sighted to 1200 meters. A.A. course and speed sight (Fliegervisier 38).	

*Turmzielfernrohr - turret telescopic sight

Turret traverse

The turret, being concentric with the gun mounting, is traversed from the mounting through the medium of a linking arm, incorporating a spring shock absorber. It can be traversed through 360°.

Dimensions	
Length	15 ft 7 in
Width	6 ft 6 1/2 in
Height (to top of turret)	5 ft 11 1/2 in
Wheel track	5 ft 5 in
Wheelbase	9 ft 3 in
Clearance	10 in
Performance	
Step	9 in
Fording	2 ft
Radius of action	roads: 175 miles cross-country: 125 miles
Engine	
Maker	Auto - Union
Type	Horch V-8, gasoline
Bore	78-mm
Stroke	92-mm
Capacity	3.71 quarts
B.H.P.*	75 at 2,000 rpm
Fuel capacity	
Two 11 gallon tanks	
Consumption	
Roads	8 mpg
Cross-country	5 mpg
Brakes	
Mechanical - cable operated	
Both hand and foot brakes operate on all four wheels	
Gearbox	
Type -	crash
Ratios -	5 speed and 1 reverse
Suspension	
Type -	independent springs -- each assembly consists of two unequal length radius arms and two coil side by side arranged between lower radius arm and chassis frame.

*Brake horse-power

[redacted]

Tires
  Type - low pressure, cord reinforced
  Size - 8.19 x 18 in

Vision
  Hull - rectangular slotted visor in front plate for driver, hinged at top and opens outward
  Turret - vision slit in each side plate. All vision devices have provision for fitting laminated glass blocks.

(b) Type 221

The Sd. Kfz. 221 has no radio, but communicates by flag signals. It mounts only an M.G.34, although a submachine gun M.P 38 or 40 is carried as auxiliary armament. It has a crew of two. The turret is seven-sided truncated pyramid, with a wire-mesh grid over the fore part only. Vehicle weight is 8,848 pounds. Fuel capacity is 24 gallons. Other specifications are the same as for the Type 222.

(c) Type 223 (Radio)

This, too, mounts an M.G. 34 as main armament, and carries a submachine gun M.P 38 or 40, like the Sd. Kfz. 221; but it has radio communication and a crew of three. A horizontal rectangular aerial is supported above the car on four uprights which can be folded downwards and backwards, giving the gunner a clear field of fire. In both positions the grid resembles a railing round the top of the car.

(1) Specifications

Specifications are the same as Type 222 except the following particulars:

Weight
  Loaded 9,632 pounds

Fuel capacity 24 gallons

Turret Roofless forepart covered with wire mesh grid.

CHEMICAL WARFARE

7. GERMAN USE OF AREA SMOKE SCREENS

Air raids on military targets in Germany and in the occupied countries have compelled the Germans to intensify defensive measures through the use of area smoke screens (see *Tactical and Technical Trends* p. 8, No. 24 for previous reference to this subject). Such screens have been used to confuse our bombers by obscuring their targets and to interfere with our photographic reconnaissance.

Screens used early in the war showed progressive development but were,

*Based on information as compiled by the Office of Chief of Chemical Warfare Service.

[redacted]

in many cases, quite inadequate to conceal the places and installations which they were designed to protect. Small numbers of points of smoke emission, far apart, were characteristic except at Brest and Kiel where, over a period of time, screens of constantly increasing effectiveness were built up. Large, dense screens over Berlin were also noted in early 1941. It is probable that German experience at these places has been useful in the planning of screens for other cities, both inland and on the coasts. It is noteworthy that the smoke producers for most of the earlier screens were placed in close proximity to the targets.

Later screens show a greater similarity in technique, although there are still considerable divergences, some of which may depend on the relative importance placed on the defense of one point as against another.

Features of current activities in smoke screen defense are as follows:

(1) Daylight Screens

Coincident, no doubt, with the daylight raids of the U.S. Air Force, the Germans have been making much greater use of daylight screens than they did before January of this year. The technique appears to be the same as for night screens.

(2) Placement of Smoke Producers

An average spacing of 75 to 100 yards between smoke producers is the current practice, according to latest information. More closely placed producers have, however, been seen in several places, notably Berlin, Warnemunde, Gdynia and Foetten Fjord. In no place does it appear that any system of equal spacing is rigidly used. The different smoke-producing capacities of various types of equipment used and the directions of prevailing winds are undoubtedly controlling factors.

In some cases the smoke producers are now being located at considerable distances from the targets. This is done to conceal landmarks in the vicinity which would enable attacking airmen to estimate accurately the position of the target even when it is covered by a heavy screen.

It is a tribute to the effectiveness of our bombing raids that the enemy have been driven to the necessity of greatly increasing the size of their screens, involving more rapid consumption of their supplies of smoke chemicals and the provision of greatly increased amounts of equipment. At Bremen recently, smoke ejectors were seen to extend for a distance of 12 miles east and west and 11 miles north and south.

(3) Subsidiary and Decoy Screens

Other tactics tried for the purpose of protecting vital installations have

included the use of separate subsidiary screens to hide easily identifiable landmarks, and the use of decoy screens to confuse attackers as to the real location of their targets. Tactics of this kind are probably more effective at night.

(4) Time for Screen Build-Up

The time required by the Germans to build up an effective screen averages 15 to 20 minutes after the alarm is given.

(5) Number of Smoke Producers Used

The number of smoke generators necessary to produce a good screen depends on generating capacity. At Emden, 56 generators, spaced from 60 to 110 yards apart, formed a dense layer of smoke extending for 3 1/2 miles; at Brest, at least 117 generators were used, 70 yards apart on the fortifications, elsewhere 90 to 130 yards apart.

(6) Smoke Producers On Boats

To provide coverage over harbors, smoke producers are placed on moles and jetties and on small craft, suitably located, as well as on roads around the towns. At St. Nazaire, 17 barges anchored in the Loire river up-wind from the city, have served this purpose. Smoke floats may have been dropped off boats into the waters or harbors to increase the smoke output of spray equipment.

(7) Smoke Producers on Trucks

Smoke producers mounted on trucks have been used to reinforce smoke screens by moving from place to place according to need as dictated by wind direction and velocity.

(8) "Dazzle" Effects On Screens

Searchlights have been used in connection with low-lying smoke screens, not to pick up attacking planes but to cause a dazzle effect when the light is reflected by the millions of tiny particles of smoke cloud.

(9) Pouring Smoke Liquid On Water

Either experimentally or, more likely, because of a shortage of spraying equipment, the Germans, on a few occasions, have poured smoke liquid into the waters of a Norwegian fjord to produce a screen. It was estimated that it took a half hour before an effective smoke cover could be produced. The liquid used in this way was not identified but was possibly either titanium tetrachloride or a chlorsulphonic acid oleum mixture.

[redacted]

(10) Places Where Area Smoke Screens Have Been Used by the Axis

Berlin	Naples
Bizerte	Osnabruck
Bremen	Palermo
Brindisi	Politz
Brest	Rostock
Bordeaux	Sindelfingen
Dortmund-Ems Canal	Spezia
Dusseldorf	Stavengerfjord
Emden	St. Nazaire
Essen	Stuttgart
Genoa	Taranto
Gdynia	Trapani
Kiel	Tripoli
Lorient	Trondheim
Messina	Warnemunde
Morlaix	Wilhelmshaven
	Wismar

(11) Reported But Not Confirmed Use of Screens

Bohlen	Kassel
Burbach	Linden (Hanover)
Charleroi	Lubeck
Cologne	Magdeburg
Corinth Canal	Oranienburg
Duisburg	Saarbrucken
Ergste	Stettin
Gelsenkirchen	Schweinfurt
Greiz (nr. Plauen)	Toulon
Huls	Volklingen (Saar)
Ijmuiden	Wiener Neustadt
Jena	

8. ITALIAN 2-KG SMOKE POT

It seems probable that the Germans in Italy are using all available Italian equipment. An account of a particular Italian smoke pot candela fumogena 2-Kg (4.4 lb) thus appears to be timely.

a. Physical Characteristics

(1) This candela fumogena is shown in figure 1. It consists of a 30-gauge tin-plate can (2) 3 inches in diameter and 10 inches high, with a 9/16-inch recess at the top which houses the igniter pellet and striker pad during shipment, and is closed by a lid sealed on with adhesive tape. The bottom of the candle has a zinc

well, 3/4-inch diameter and 1 3/4 inches deep, into which the igniter pellet is inserted for firing. The candle is painted dark green and has a label with the marking F/ZN and instructions, (for use) translated as follows:

(a) Pull off the tape, take off the cover, and take the striker and igniting cartridge from the receptacle.
(b) Place the igniting cartridge in the zinc tube in the bottom part of the candle.
(c) Ignite by rubbing the striker on the matchhead.
(d) Place the candle lying down on the ground.
(e) Get away, preferably up wind.
(f) When the igniter does not set it off, try another.

NOTICE: The candle should be kept in a dry place.

Figure 1 (the smoke pot) shows the compartment in which the ignition element is shipped; the candle (2) shows the recess for the ignition element (6) - the latter consisting of a scratcher pad (4) with waxed wrapper (5) and cover (3). The match head, of the Bickford type fuze and starter pellet is wrapped in a waxed paper wrapper with a waxed paper sleeve (7).

(2) In a smoke pot which has been examined, the candle weighed 2.27 kilograms (5 lb) and contained 2.03 kg (4.47 lb) of the following Berger-type smoke elements:

Zinc Chloride (water soluble zinc)	0.80%
Zinc Oxide	21.07%
Zinc Dust (total zinc minus zinc chloride and zinc oxide)	25.83%
Kieselguhr (hydrochloric acid insoluble)	12.03%
Carbon Tetrachloride (by difference)	40.27%

(3) The igniter element weighed 10 grams (.35 oz) and consisted of a matchhead of the antimony sulfide-potassium chlorate type, a 1-inch length of Bickford type safety fuze, and a starter pellet 11/16 inches in diameter and 1 inch long, of the following composition:

Potassium Nitrate	55%
Calcium Silicide	45%

The calcium silicide consisted of approximately 31% calcium, 64% silicon and 5% iron.

(4) The scratcher pad was made of 1/16-inch cardboard, 5/8 inch by 1 3/8 inch, and sensitized on one side.

(5) Inside the can, on the bottom, were two cardboard disks, 2 and 13/16 inches in diameter, and 1/16 inch thick. The disks were probably used for insulating the bottom of the can in case the starter element was accidentally ignited.

[redacted]

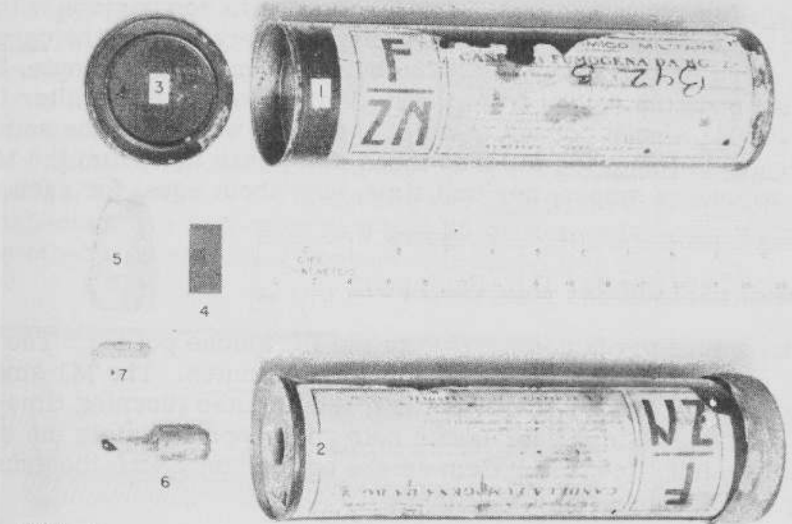


FIG. I

ITALIAN 2-KG. SMOKE POT

FIG. 2

AMERICAN MI (LEFT), AND
ITALIAN 2-KG. SMOKE POT (RIGHT)

[redacted]

b. Functional Characteristics

One candela fumogena was tested for functioning in comparison with the HC smoke pot, M1 (see figure 2). The Bickford type safety fuze in the candela fumogena gave a delay of 2 to 3 seconds. The burning time was 1 minute, 15 seconds. For the first 15 seconds the smoke from the Italian smoke pot was whiter than the smoke from the M1 smoke pot, after which the color was about the same. The smoke from the candela fumogena pillared much more than that from the M1 smoke pot. The volume of smoke, per unit time, was about equal for each smoke pot.

c. Comparison With Similar U.S. Equipment

The Italian smoke pot is comparable to the HC smoke pot M1. The candela fumogena weighs 5 pounds gross and burns for 1 1/4 minutes. The M1 smoke pot has a gross weight of 11 pounds and burns for 6 1/2 minutes (burning time varies between 5 and 8 minutes). Since both smoke pots gave approximately the same volume of smoke per unit time, the Italian smoke pot had only 45% the gross weight efficiency of the comparable M1 smoke pot.

The assembly of the M1 smoke pot is considered superior to the Italian since the ignition element in the base of the Italian pot is an extra part to be misplaced, but gives no added advantage. The need for the delay furnished by the Bickford type safety fuze on the Italian pot is not apparent, except that occasional scattering of burning material might endanger personnel.

ENGINEERS

9. ENEMY MINING OF ROADS

The Germans have used many different methods of mining roads. One method used in Tunisia is shown in figures 1 and 2. Three Tellermines, each having its igniter in position, were coupled together by an Italian detonating fuze. Groups of

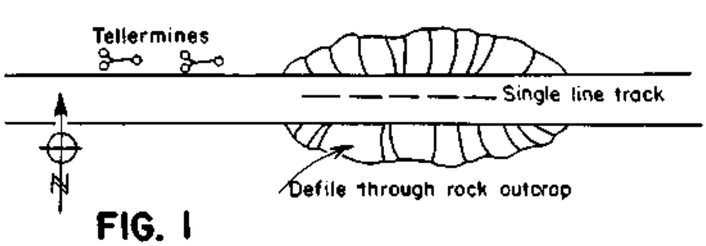


FIG. 1

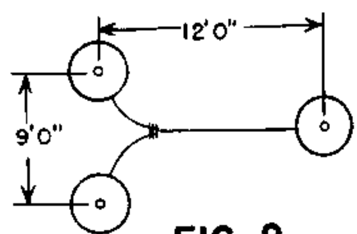


FIG. 2

the coupled mines were placed along the sides of narrow roads where vehicles might be expected to pull aside to permit another vehicle coming in the opposite direction to pass. The reason for using the three Tellermines together was probably

[redacted]

to ensure the maximum amount of damage to enemy vehicles.

Figures 3 and 4 show methods recently used in coupling antipersonnel mines to Tellermines. Figure 3 shows a Hungarian antipersonnel 3-pound mine (previously thought to be of Italian origin) connected by a wire inserted in the inner hole of the striker mechanism and tied to the handle of a Tellermine. The antipersonnel mine was buried about 18 inches below the surface of the ground. Figure 4 shows an S-mine laid about 5 feet from a Tellermine. The S-mine was fitted with the normal "Y" piece and two Z.Z (time fuze) 35 igniters. One igniter was connected by a pull-wire to a Z.Z 35 igniter in the side hole of the Tellermine and the other was similarly connected to an igniter in the base.

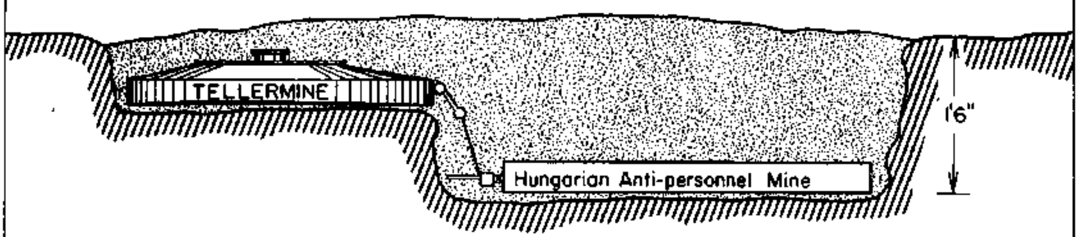


FIG. 3

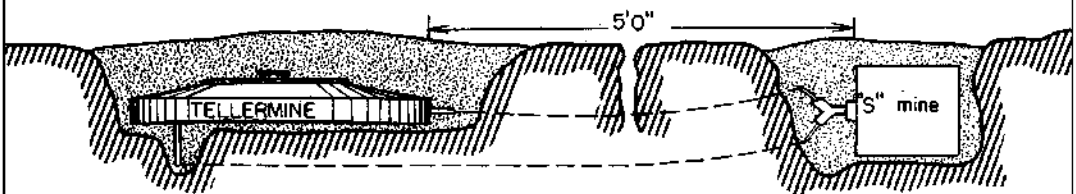


FIG. 4

During their withdrawal from the Mareth position the Germans mined a road leading through a pass, the mined area being approximately 250 yards long, (see fig. 5). The east zone consisted of unarmed wooden box mines (presumably Italian) connected by Italian detonating fuze to similar mines which were armed. The distance between armed and unarmed mines was about 15 feet. A stick of gelignite was used under the loose cover of the unarmed mines so that the detonating fuze would explode them. In the west zone, Tellermines were connected by Italian detonating fuze to wooden boxes holding about 8 pounds of Italian gelignite. In both zones the rows of unarmed charges were interconnected with detonating fuze,

[redacted]

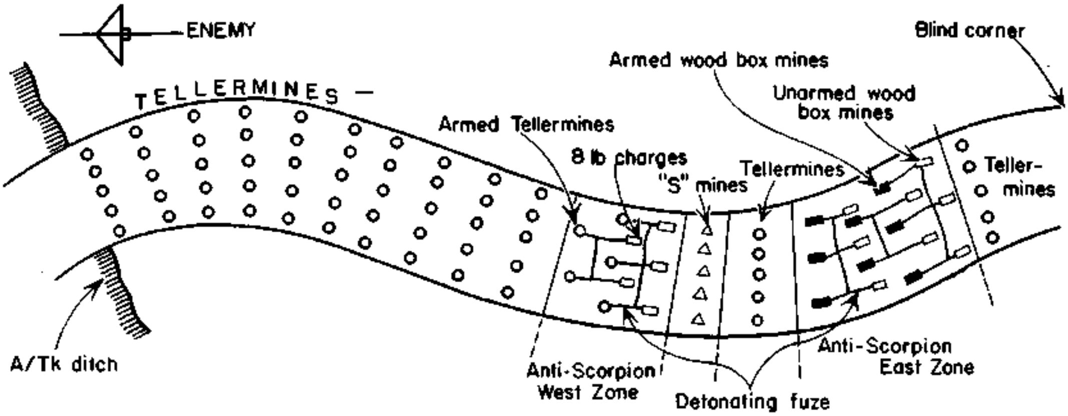


FIG. 5

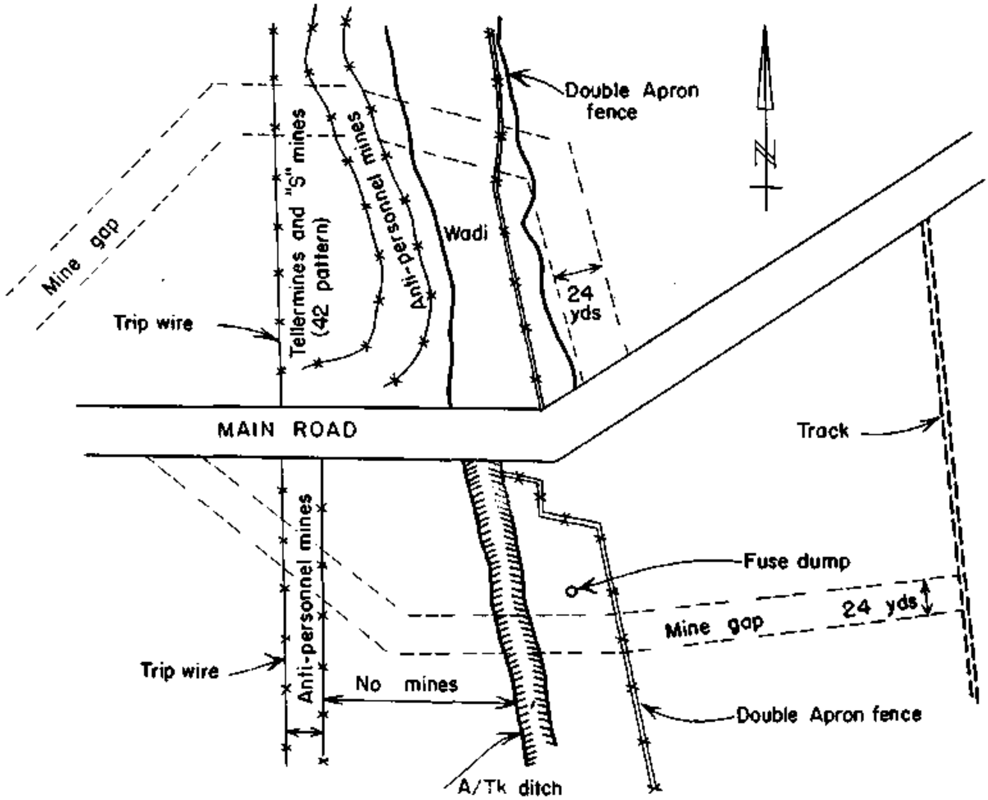


FIG. 6

so that had any of the armed mines been exploded, the whole row would have been detonated.

A diagram of another German road-minefield, recently encountered, is shown in fig. 6.

On the north side of the road two mine belts were discovered between the tripwire and the wadi. The first belt contained Tellermines, some of which were booby-trapped, S-mines were not laid in a definite pattern. The second minefield was a narrow belt 25 yards wide next to the wadi containing Italian antipersonnel picket mines and Italian wooden box mines. On the enemy side of the wadi no mines were detected.

On the south side of the main road only one belt of mines was encountered. This consisted of Italian picket mines and Italian wooden box mines laid in a 25 yard belt. The mines were not laid in any definite pattern. The front edge of the minefield was marked with a single strand of barbed wire knee high, and the enemy side with a double-apron fence. Both sides of the antipersonnel minefield were marked with a single strand of barbed wire. The total number of the mines lifted were as follows:

Tellermines 42 pattern	75
S-mines	23
Italian wooden box mines	222
Italian picket mines	19

10. GERMAN CAMOUFLAGE METHODS IN SICILY

Study of enemy camouflage in the Sicilian campaign tends to confirm the impression gained in the closing stage of the North African campaign that enemy methods in this direction have improved.

The Germans, generally, have made good use of available cover and terrain, while the Italians, no doubt prompted by their former ally, seemed to have taken a serious interest in camouflage, with mixed success. The fieldcraft and camouflage behavior of individuals, particularly Germans, was very good and full use was made of the many opportunities offered by the type of country concerned.

<u>a</u>. <u>Dummy Aircraft</u>

These aircraft were of good quality, and from makers' marks it is obvious that they were mass-produced in Germany.

<u>b</u>. <u>Pillboxes</u>

The camouflaging of pillboxes sited to deal with landing forces has, not surprisingly, been the object of a great deal of effort on the part of the enemy.

[redacted]

Great care was taken to blend these pillboxes--mainly made of concrete--into the general ground pattern. The profusion in the island of walls, small houses, and huts, has helped this form of camouflage.

In one section (the Pachino area) several pillboxes were covered with complete huts made of straw. One pillbox overlooking a road junction was an actual small house, reinforced with concrete and having a weapon slit just above ground level.

Examples seen in another area were straw-roofed and sited on slopes in the vicinity of limestone ledges, which made recognition difficult. They had straw "blinds" to cover the weapon loopholes. One pillbox noted and photographed was sited against a wall, and an attempt had been made with paint to simulate the pattern of the stone wall.

Many of these pillboxes were revealed by the poor siting of their defensive wiring. Instead of being sited to blend with the ground pattern, wire was taken haphazardly across fields. Many of the pillboxes were never used.

c. Gun Positions

Of the gun positions studied, half had been camouflaged overhead by grass-covered nets. Although the remainder had no overhead concealment, the guns themselves were garnished with brushwood or similar, natural material. Many gun positions were indicated by tracks, etc., and poor camouflage. Here and there, however, a good site was found; for example a single gun position, where the pit was dug out of an embankment at the side of the road. This position had a low overhead canopy of grass-covered nets, branches and the like.

One antitank gun position is worthy of comment. The gun was sited in a recently cut cornfield on a forward slope. There were several stacks of straw in the field, and a further stack had been constructed around the gunshield. This simple treatment was, from all appearances, successful.

d. Weapon Pits

Some examples of covers for weapon pits have been encountered. In each case the camouflage consisted of straw matting raised on poles about a foot above the pits.

e. Sniper Equipment

Snipers' clothing comprised two jackets, one having a helmet cover to match. They were of good cloth, printed with disruptive patterning of various colors. The jacket that had the matching helmet cover was made up of a close-weave cloth with an elastic inset at the waist. It can be used either the normal way or inside out. The outside pattern has a background of green, the inside of brown. The helmet cover is carefully made, also reversible, with elastic insets and holding hooks. The second jacket is of twill, tailored on the usual lines, and of a general

green color disrupted with brown. Both jackets blend well with the natural environment, but they both have the weakness of still revealing characteristic outlines, because they both fit closely to the body.

11. ENGINEER OPERATIONS IN THE JUNGLE

Military engineering under the most favorable weather conditions is a difficult art, particularly when complicated by the opposition of an alert and resourceful enemy. In tropical jungles and with native troops, the work is one of extreme difficulty. The following paragraphs are a condensed resumé of a report made by an experienced British officer after five months of such operations.

a. Preparation

(1) General

To begin with, the officer writes, everyone should know how to swim and how to fight with automatic weapons. The men must be "absolutely fit" physically, and trained to take care of themselves in the field, which includes security discipline. Frequently engineers are engaged in cutting trails and building or repairing bridges, far from the protection of supporting units. Under these circumstances, it is absolutely essential that they be capable of repelling any probable attack. They must, moreover, be able to change quickly from motor transport to animal, and to understand the methods of animal-pack loading. Mechanical transport can only be used on good roads.

(2) Map Reading

Map reading must include both ordinary and stereoptican aerial map interpretation. A case was cited where a route for a trail was decided upon from the direct terrain observation and examination of existing maps. After two days work in cutting the trail, it was found to lead to a vertical cliff and had to be abandoned. Had this route been closely scrutinized by stereoptican interpretation of aërial photographs, the mistake would not have been made.

b. Notes on Jungle Operations

(1) Mine Fields

Jungle operations have their own problems in regard to mines and booby traps, since it is difficult to make sure the mine fields are properly marked and sited. For this reason, the writer comments, the division commander was reluctant to use them.

(2) Bridging

As most streams were tidal with muddy bottoms, nearly all bridges were

of timber-pile construction, with the material cut in the neighboring forest. A local type of pile-driver was used to sink piles 6 to 15 feet in the ground. While bridge-building was slow at first it became very fast with experience. The rate of progress by four squads of engineers on a pile bridge was about 30 running feet of bridge per day.

(3) Water Supply

Water was supplied by a local type of well-digging apparatus. Two-inch pipe with a nose piece was driven by the same equipment used in pile-driving.

(4) Care of Tools and Supplies

Attention must be given to the care of tools and supplies. This is the particular duty of the maintenance units. Early requisitions of other needed supplies were essential because of the distance from base, and there was a paramount need to use all local resources.

(5) Driving in Mud and Sand

Drivers should be trained in driving under all sorts of jungle conditions, getting on and off ferries, over wet ground, soft sand and in water.

(6) Maintenance of Communications

It is stated that 95 per cent of the engineer work was devoted to maintenance of communications, which included the building of dirt roads by the shovel-and-basket method, erecting bridges and ferries, and the construction of landing points. Native labor was used to within 5 miles of the front; after a bombing raid, natives were apt to desert. When all-weather roads were requested, they were built by the rear elements, which constructed brick fire kilns, made bricks and laid them with native labor.

(7) Tidal Streams

On large tidal streams, bridging was out of the question and folding boat equipment was invaluable. Assault boats were used to make improvised rafts for the transportation of animals. Getting across was easy but seventy-five percent of the time was consumed in getting on and off the rafts. Landing stages were built at different levels to cope with the tides, extension landing ramps being used on muddy ground.

Where tidal variations were not too great, pile bridges were built, and the small box-guirder type was used over narrow gaps, to be replaced later with trestle-type.

(8) Native Labor

Native labor was considered to be an advantage and 20,000 natives were

[redacted]

used at one time in a division area. The natives supplied their own food. Management was carried on through groups of about 40, under a foreman who was usually the village head man working under the engineer commanding officer.

(9) Supply Dumps

Supply dumps were established for wire, AT mines, etc. When an issue was made from a forward dump, that dump was replenished from one of those in the rear echelon as required. No regular daily supplies were sent. Material was transported by trucks from the motor pool.

(10) Ferry Discipline

Ferry discipline is most important. Engineers, particularly when under fire, have enough to do without handling the priority of individuals in crossing a ferry. That is MP work.

c. Equipment

(1) Weapons

There was need for additional light machine guns and submachine guns. Booby trap mechanisms were badly needed - two officers were killed attempting to make and install booby traps. The explosive provided must be capable of withstanding heat and dampness.

(2) Tools

Long knives of the machete type were invaluable Every man should carry one. Spades as well as shovels were required. Power tools should not be too heavy and power saws were valuable, as were the bull-dozers and graders. Some small motor-driven circular saws would have been useful.

The following tools were recommended as a squad tool set, and made up one mule load.

crowbar	axes, pick (four)
auger, wood, 3/8 x 4 1/2 in	axes pick, spare helves (two)
adze 4 1/2 lbs	shovels, engineer (four)
chisel 1 in	shovel, spare handle
hammer, carpenter's claw, 1 1/2 lbs	maul
hammer, sledge 10 lbs	rod, measuring 4 ft
saw, cross-cut 4 ft	tape, steel 100 ft
saw, hand, 26 in	tapes, tracing (two)
jungle knives, light (two)	level, field service
jungle knives, heavy (two)	cutters, wire
rope 1/2 inch	wire, 14 gage, 1 lb
ax, long-handled	nails, wire, 3 to 6 in, 1 lb

tape, 1/2 inch, lashing, 6 rolls

[redacted]

(3) Bridging and Ferrying Equipment

Outboard motors and other propulsion units which can be attached to rafts and reconnaissance boats were both in demand. On one occasion, proper pontoon equipment, which was lacking, would have saved three days in moving a brigade to meet a vigorous attack.

(4) Motor Transport

Shortage in motor transport was met by pooling. One jeep for each engineer company commander would have been desirable. Flat-bed, American-type trucks were particularly useful in handling engineer supplies.

(5) Clothing

The overall type combat uniform was not popular with either officers or men, who preferred shorts, particularly for working in water. Obviously, for protection against malaria, shorts are inadequate.

(6) Tubular Scaffolding

Tubular scaffolding would have been extremely useful in making jetties and for general landing purposes. It is quick to set up and is adjustable.

INFANTRY

12. GERMAN DEFENSE OF POSITIONS

A German directive for the defense of positions gives some interesting details of German defensive tactics during recent campaigns. A translation of the document is as follows.

*　　　　　*　　　　　*

1. Every man must be aware that the defense of a position must continue to the last man and to the last round. Every commander is fully responsible for the defense of the interdependent defense area assigned to him. It is not permissible, for instance, that the heavy weapons platoon-leader command the heavy weapons employed on the right as well as on the left flank of the company.

2. The enemy must be prevented by all means from removing mines or other obstacles which are laid in front of the position. Machine guns are most effective for this purpose.

3. All available machine guns are to be employed on the flanks when

possible. Especially at night the machine guns must command the entire terrain to the front. Shortly before dusk every machine gun, light machine guns included, will therefore be sited so as to be able to cover their designated zones. These sectors will be suitably marked. The sector of fire is to be marked by stakes on the right and left limits; the elevation, by a wire stretched horizontally.

4. The heavy weapons and artillery are placed in relation to the light infantry weapons in such a manner that their fire-power can be primarily directed against important positions and terrain features, which the enemy might possibly use during his approach.

5. Officers of all grades are responsible for the continuous preparedness for defense. In addition precise written orders are to be drawn up for each position, about which each man must be repeatedly instructed, and which he must know by heart. These orders must show, among other things:

(a) The position of the enemy, the defense-sector, adjacent units, scout-troops, and the security toward the front;

(b) Observation and scouting patrols by day and night;

(c) Supervision of order and alertness in the position. Fire preparedness of the weapons and the storage of ammunition;

(d) Action to be taken: under enemy artillery-fire (for instance, the soldier takes cover, with his machine gun or rifle, in his fox-hole); low-level air attack (machine guns fire at will); action by enemy assault troops (alertness for hostile feints); infantry-attack, tank-attack; penetration by adjacent unit;

(e) Significance of pyrotechnical signals, password.

13. PORT MORESBY--ATTACK DIRECTIVE

The following notes taken from an Allied publication, were issued in the abridged form in which they appear in this article. They are based on an original operational directive of a Japanese infantry unit which was to have taken part in the attack on Port Moresby. The wording of the directive has been followed, and although the actual text has been paraphrased somewhat, literal translations have been left where they appear typically descriptive or apposite.

* * *

a. Main Considerations

Most of the fighting will take place in jungle country. River crossing

[redacted]

engagements will be frequent. Enemy equipment is excellent.

b. Approach March

During the crossing of the Owen Stanley Range, the column will probably be spread out over a considerable distance; but on approaching more level jungle country, the column will close up to ensure adequate control and immediate readiness for battle.

(1) Speed -- Rapidity of the advance is of paramount importance. Any delay will give the enemy time to destroy bridges and build obstacles. Be prepared to swim across rivers if bridges are destroyed.

(2) Communications -- Commanders will ensure that full agreement is reached on signal communications, and that radio sets are correctly distributed. On the march, Bn. Hq. will have either a No. 5 or a No. 2 set, Co. Hq. a No. 6 set, and unit or organization Hq. No. 3 sets. All communications will be tested at halts.

(3) Reconnaissance -- Reconnaissance patrols must precede the main body. Their primary task will be the reconnaissance of ground so that during the approach march the maximum use can be made of cover provided by natural terrain features.

c. Battle Drill (General)

(1) Leadership -- The resolute leadership of junior commanders is essential to ensure that nothing holds up the speed of the advance. Prompt action in dealing with unforeseen situations is a guarantee for quick success. "If the advance is delayed, enemy preparations on the one hand will become greatly improved; while on the other hand our own ammunition and food will become exhausted and the sick will increase. Therefore each unit will ignore severe hardships, resolutely and promptly enter the fight carrying out the assault to the final objective."

(2) Alternative Methods of Attack -- Decoy the enemy from one direction by the use of smoke, firing or even shouting, and attack him from an unexpected direction. Utilize the advantages of rain and fog for catching the enemy off guard. Make an attack when our own aircraft are bombing the enemy. "Make an assault suddenly from positions which the enemy believes to be unapproachable, such as cliffs, rivers, streams, steep inclines and jungle."

(3) Precautions -- During an attack, avoid grouping in exposed positions such as hill tops, villages and bridges which provide excellent targets for enemy machine guns, artillery and bombing. For example, when one unit attacks, the following unit should deploy and take cover to prepare for the next assault.

d. Special Considerations

(1) Night Attacks -- "The use of dusk, night and dawn is a special tactical characteristic of the Imperial Forces. Although fatigue may be great from the combat during the day, courage must be renewed to take advantage of darkness to

[redacted]

develop the engagement."

On account of the heavy fire-power of the automatic weapons of the enemy and their skill at close-range firing, a headlong frontal attack, even at night, should be avoided. A night attack must be carefully planned, and full advantage taken of natural terrain features.

(2) Flanking Envelopment -- The utmost use should be made of natural cover. Part of the force will make a holding attack on the enemy's front, while the main body deploys to make a "bold, resolute and prompt flanking movement" to attack the enemy rear. Smoke should be used if the enemy anticipates the maneuver.

(3) Close Range Reconnaissance -- Patrols composed of personnel especially selected for their good eyesight (such as fishermen or the aborigines of Panape Island) should be formed for close-range reconnaissance of the enemy positions in thick jungle.

(4) Jungle Fighting -- No jungle country is impassable. On the contrary, its special features should be extensively utilized for surprise and out-flanking tactics. Infantry units must be adequately equipped with machetes; native knives are also suitable for hacking a way through thick jungle.

(5) Hostile Aircraft Attack -- With the considerable increase in enemy air activity, the following precautions will be taken: rapid deployment, night moves when practicable and use of natural camouflage and camouflage equipment. The location of the headquarters will be carefully chosen and the movement of personnel and vehicles around this area should be reduced to a minimum. If possible, each unit should detail an officer to be responsible for locating the headquarters of his organization. Wooded areas should be used for the camouflage of guns and ammunition. Smoke from cooking will be a certain target. Troops should accordingly be warned to keep at least a hundred yards distant from the source of any smoke during a raid. On the other hand smoke can frequently be used with success as a decoy.

(6) Communications -- When units are operating in an independent role, difficulty is often experienced in maintaining communications when fighting. Pay particular attention to the following points: find out when and what to report, send out as many (situation) reports as possible, and make certain that a report is sent out at least three times a day, even if it is only a unit position report. Ascertain the whereabouts of the radio section and confirm that it has been issued a communication time schedule. In general signal communications have fallen far below expectation.

(7) Use of Compass -- As most of the fighting will take place in jungle country and maps are inaccurate, as many compasses as possible should be distributed. The maximum information on road conditions should be obtained from our patrols, prisoners and natives.

(8) Enemy Supply Depots -- If the battle does not progress favorably,

[redacted]

enemy supply depots should at all costs be captured intact in order to ease our own supply difficulties. The enemy must be prevented from destroying his supplies.

(9) Use of Captured Weapons and Ammunition -- As our units are only lightly equipped with arms and ammunition, make a careful study of enemy weapons so that they can be utilized when captured. Note that our advance elements have already captured a quantity of enemy rifles and ammunition which have been found extremely useful.

e. Intelligence

All captured material and documents from prisoners and enemy dead must be promptly handed over for examination.

All important information including estimated losses, abandoned enemy corpses, captured weapons, and ammunition expended must be turned in by platoon and company commanders. Accuracy in the compilation of these reports is not essential, but speed is important.

Comment: Although much of the above may now seem trite, the theme running through the directive is still the basis of Japanese tactics. Note the special emphasis on careful reconnaissance, speed of advance, night attacks and the flanking movement through "impassable and impossible" country which have been the predominant features of Japanese battle drill wherever they have fought us. Note also that their G-4 staff are encouraged to cut supplies and equipment to the bare minimum and are permitted to anticipate the utilization of enemy equipment and especially supplies.

14. SOME GERMAN TACTICS IN TUNISIA

The following article is based on British reports dealing with German tactics in Tunisia. The reports emphasize the fact that because of the nature of the terrain, the tank played a less important part in the Tunisian fighting than in desert action but the mortar was used extensively. Since the Germans are exceptionally adept in the employment of this weapon it may be expected that the mortar will be widely used in the European theater (see Section II, p.47).

In considering the reports from Tunisia two points should be borne in mind: (1) tactics varied with the morale and efficiency of units, particularly in patrol activities; (2) during the later stages of the campaign the Germans were handicapped by a shortage of tanks, ammunition and gasoline, and throughout the campaign they suffered from a shortage of artillery.

The following are extracts from the British report:

* * *

[redacted]

a. Attack

Night operations by anything more than a fighting patrol were exceptional and first light was the favorite time for attack. However, German teaching based on experience in Russia has stressed the necessity of avoiding this rigidity in the timing of attacks.

Night approach marches of from 10 to 20 miles were made frequently prior to attacks. Infiltration was often skillfully executed but sometimes the Germans advanced in close formation. Reserves were seldom kept back to influence the course of battle.

b. Defense

Forward positions were thinly held, with sometimes two companies holding a frontage of 1,500 to 2,000 yards.

Knolls were always mutually supporting within company positions. A system of well-coordinated observation posts, equipped with machine guns, allowed a large proportion of the troops to rest by day at the foot of the reverse slopes, while at night the forward elevations (the day OPs) were held by platoon or section outposts. These OPs were usually 500 to 1,000 yards forward of the main positions. Observation posts usually possessed good communications facilities, both laterally and to the rear. Outposts sometimes signalled to the rear with colored lights.

Antipersonnel mines, with tripwires near tracks and on likely patrol approaches, were employed.

Machine guns were sited down reverse slopes to engage attacking infantry approaching another objective. Defilade positions and concealment were good. The enemy made considerable use of alternative positions.

Counterattacks were either preceded by machine-gun or mortar fire already registered or they were made immediately from the reverse slope of the captured position.

When the Germans have sufficient forces at their disposal they will always attempt a counterattack before the attackers have time to organize.

c. Withdrawal

The Germans undertook the usual demolitions and road blocks. Apart from these, the counterattack at chosen points on the axis of advance had excellent delaying effects. These counterattacks can prove costly to inexperienced troops advancing with more zeal than prudence.

d. Patrols

In close contact, the Germans did not patrol offensively at night, nor did

[redacted]

they attempt deep reconnaissance. Many patrols were 30 to 40 strong, and they often moved at night in close formation, which made them vulnerable to ambush. However the Germans relied on their strength and made little attempt at concealment.

Often the Germans established advance positions for the purpose of surprising British patrols on the move. An ambush would be prepared early in the night, sometimes far in front of the German lines if a wide area existed between opposing forces, and any British patrol which used the same route continuously paid the penalty.

When the Germans made raids with patrols of platoon strength, their technique was to penetrate and then open fire with grenades and light machine guns, capturing prisoners in the confusion caused by the surprise attack.

e. Summary

The German always tries to outflank his enemy. This has been seen even in the preparation of an ambush or in the method of holding even a farm or a group of buildings where a machine-gun cross-fire is created by means of guns sited adjacent to the farm or buildings. The German particularly believes that both from the tactical and morale points of view, attempts should be made, whenever possible, to fire on the opponent from the rear.

In Tunisia the Germans continued their deceptive practices, using, among others, the following ruses:

The speaking of English words and orders on patrol and during night attacks;
Placing a second mine tripwire where a person might step while trying to avoid the first wire;
Answering British Very lights with exactly the same signal, often causing confusion, to the enemy;
Placing a row of Tellermines on the surface of a road, backed by another row well-concealed 100 yards farther on.

When in close contact, the Germans use many snipers. At close quarters the Germans use smoke grenades to aid themselves in escaping from difficult positions.

At the beginning of the Tunisian campaign, "Tiger" tanks were used with great boldness. When the tank commanders were sure that their flanks were secure they drove straight on. The "Tiger" tank must be regarded as a formidable weapon. Given adequate flank protection it adds very effective weight to German fire power.

In defense, these tanks were well-sited in covered and defiladed positions. PzKw 3's and 4's were used extensively to protect the flanks of the "Tigers."

Tank recovery was often effected with speed and courage. Disabled tanks were towed away by other tanks. When the Germans held the battlefield, tractors were brought up and the area was cleared of both German and enemy tanks in a very short time. When night came as much as a company of infantry was used to hold off our patrols or to stage a diversion while recovery was in progress.

The standard of concealment of German artillery was uniformly high and many alternative and dummy positions were used. German counterbattery fire was ineffective.

Eight-eight millimeter guns were used normally in batteries of four, often with two or three batteries supporting each other. Self-propelled antitank guns were used from hull-down positions to give covering fire to tanks as they went into the attack. These guns were also used against British reconnaissance units, withdrawing before an outflanking movement could be carried out. A roving 88-mm gun was used. Dumps of ammunition for it were placed at suitable points.

In Tunisia, the most important fighting qualities revealed by the Germans were boldness, thoroughness of organization, a high standard of technical proficiency and a detailed preparation in all operations.

MEDICAL

15. GERMAN MEDICAL NOTES

The demands which totalitarian war make upon the medical profession may be expressed in one sentence. "It is the duty of every medical officer, as a soldier, to direct his entire work and mode of thinking toward one goal, namely to strengthen the moral and physical strength of the armed forces in every respect; and to restore to health, safely and quickly, that part of it which has been injured and weakened."

German medical research in this war as in the last has applied its advanced technical and research facilities into probing and healing the wounds of battle. All research now centers in the Military-Medical Academy, the Institute for General and Defense Physiology, and the Institute for Physiological and Defense Chemistry, located in Berlin, according to an article on German medical research appearing in the Deutsche Zeitung in Norwegen. Some portions of this article are reproduced herewith as indicating various special techniques developed for the different cases reported.

a. Climatic Testing Laboratory

One type of special equipment is found in the Climatic Testing Laboratory. Here studies can be made of every combination of pressure, temperature, humidity, air composition, and their effect on the human body under work, rest and with varying diet.

An example of the accuracy of the devices used in the tests is the recording scale. This is said to record losses through perspiration to one tenth of a gram: yet the device is so large that it contains bed, working space, instruments, etcetera.

The person also can be exposed to winds of varying force when in the performance of labor under tests, in order that the tempo of work, proper rest periods, suitable clothing, etc., may be accurately determined under varying climatic conditions. The article states that this research work is important not only for its military value but also on the industrial front involving special industries such as mining, chemical manufacturing, and under all conditions subject to a "working climate".

b. Use of Spectroscope for Wound Diagnosis

In the diagnosis of wounds at the front, a notable procedure is that of observation with the spectroscope. It is frequently necessary, the article states, to ascertain the nature of the projectile which caused the wound, or the metal of which the projectile or splinter was composed. This is done with a small portable, but very sensitive spectroscope, which accurately records minute metal traces on the edges of the wound, down to a weight of one millionth of a gram and less.

This procedure is said to be important even in civilian life, especially in the investigation of crime.

The spectroscope has another important military use, the article states viz., the analysis of the soldiers' rations to establish the mineral contents. In addition to nutritive ingredients and vitamins, the food must contain minute proportions of certain metals, as zinc, manganese, copper, etc., and this can be easily ascertained through the use of the spectroscope.

ORDNANCE

16. GERMAN PARATROOPER'S RIFLE F.G 42

The versatile German Ordnance Department has produced a new weapon in the F.G 42 (Fallschirmjaeger Gewehr 42), a semi-or-full automatic, gas operated, air-cooled paratrooper's rifle, caliber 7.92 mm (see accompanying illustrations). It is extraordinarily light for a full automatic rifle--10.75 pounds fully loaded -- conveniently stocked, and equipped with what appears to be an excellent micrometer aperture sight, an innovation in German fire-arms. The addition of a 11 1/2-inch spike bayonet appears to be somewhat superfluous, copied perhaps from the French Model 1936 rifle, but with a weapon weighing under 11 pounds, a bayonet might be used effectively.

GERMAN PARATROOPER'S RIFLE

F.G 42

[redacted]

a. General

Weight, with bayonet, and loaded (20 rounds in magazine)	10.75 lbs
with bayonet - no magazine	9.00 lbs
Length - bayonet fixed	42.75 in
bayonet unfixed	35.5 in
Type of sight, front	folding blade
rear	folding micrometer, peep, graduated 100 to 1,200 meters
Sight radius	25.0 in
Ammunition	any 7.92 Mauser rifle ammunition
Magazine capacity	20 (10 rds also said to exist)
Barrel length	19 in
Number of grooves	4
Mount	bipod

b. Other Details

The butt of the piece is of 16 gauge steel, hollow, and ridged to add to its structural strength. The receiver is of a very high quality machining, which is left without further finishing. The magazine is on the left, the ejection opening and operating handle, on the right. Trigger guard and pistol grip are light metal, and comfortable in either offhand or prone positions. The hand guard is of wood, 7 1/2 inches in length, with holes drilled in the top to facilitate cooling and ridges milled in the sides and bottom to prevent the hand from slipping. The bipod legs fold forward from a collar, to provide a housing for the bayonet, and clamp to the bayonet lug. There is no quick-change feature incorporated in the barrel, which appears odd in so modern a weapon. A combined flash hider and compensator perforated with 74, 1/8-inch holes drilled in the side of the body and with 8 1/8 inch holes drilled around the muzzle end at a 45 degree angle help to counteract the natural tendancy of the muzzle to rise in firing, although this model, like the MGs 34 and 42, is designed with the barrel practically in line with the point of support against the shoulder to minimize this annoying habit of machine rifles stocked like an ordinary rifle. The high sights of the German weapon compensate for the absence of drop in the stock. This is very noticeable in the F.G. 42. The rear sight is a 1/16-inch aperture peep with a micrometer type adjustment, but apparently no wind gauge. The bayonet is normally carried point-backward, cliped in the cylindrical stud. When it is to be fixed, the blade is removed and cliped into the stud, point forward.

c. System of Operation

Upon firing, the propelling gases are taken off through a .060-inch port, [illegible]/2 inches from the commencement of the rifling, on the underside of the barrel,

[redacted]

and impinge on a piston head .620 inches in diameter. The piston rod passes through a gas cylinder 1 1/4 inches in length, with four 1/4-inch exhaust ports at the rear end. After the head passes these ports where the gases are dissipated, the piston rod continues to move rearward through a cylindrical guide at the rear of the cylinder, under its own inertia.

The bolt mechanism is attached to the piston rod by a lug on the under side of the bolt. The lug slot is approximately 3/4 inches long and twists toward the left-hand side of the bolt, allowing the lug to cam and turn the bolt a quarter turn to the left, and disengage the locking lugs. After unlocking, the bolt moves straight to the rear, as in the Lewis gun (although the bolt is known as the Solothurn type) and the piston rod has 3/4 inch of free travel before the bolt is unlocked, permitting ample time for the gas pressure in the barrel to be released before the unlocking of the bolt takes place.

By the use of a change lever which also acts as a safety, the gun may be operated either as a semiautomatic or with full automatic fire. The change lever brings into engagement one of two sears, depending on the type of fire selected. The unique feature of the operation lies in the fact that the gun fires automatically from an open-bolt position and semiautomatically from the position of the closed bolt.

The firing pin is attached to the piston-rod lug and the bolt-body moves around it under spring pressure contained in the firing pin spring compressed behind the lug. After firing each shot, the recoil is partially absorbed by compressing a driving-rod spring which then drives the bolt forward again to carry a new cartridge from the magazine into the chamber. This completes the operating cycle.

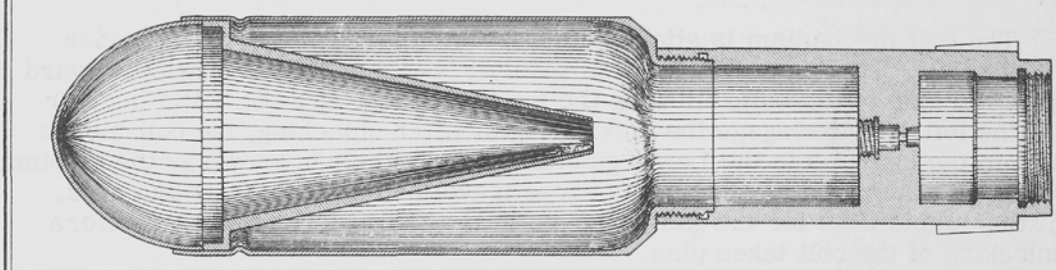
17. JAPANESE HOLLOW-CHARGE RIFLE GRENADE

Except for aerial bombs recently recovered, the only known use by the Japanese of the hollow-charge principle is in the rifle grenade, (see accompanying sketch) which is a copy of the German heavy AT rifle grenade, Gr. G.Pz Gr (see Tactical and Technical Trends No. 36, p. 34). The launcher is clamped to the standard Model 38 (1905) 6.5-mm rifle. The cartridge used to propel the grenade has a wooden bullet.

The sketch shows a sectionalized model of the grenade and illustrates the Japanese use of the hollow-charge principle. The complete round is 7.98 inches long and has a diameter of 1.58 inches at its greatest diameter. It has a bursting charge of 3.81 ounces of TNT. The cone formed in the TNT is 2.5 inches deep and 1.5 inches wide at the top.

The grenade is fired by impact with the target, a base-detonating inertia-actuated fuze being carried in the rear of the projectile behind the bursting

charge. Since the fuze is not armed until the grenade has been fired from the rifle and is in flight, the grenade is safe to handle, but it should not be jolted, since it is easily armed.



JAPANESE HOLLOW-CHARGE RIFLE GRENADE

With the exception noted above, this is the only instance of the use by the Japanese of the hollow-charge principle that has been discovered to date. It is to be expected that they will employ it in other weapons. The penetrating effect obtained is not dependent on impact velocity and the Japanese have in quantity a variety of low-velocity weapons of fairly large bore suitable for firing hollow-charge projectiles. Such weapons are the Model 92 (1932) 70-mm battalion howitzer and the Model 41 (1908) 75-mm infantry (mountain) gun.

QUARTERMASTER

18. USE OF RUBBER IN JAPANESE EQUIPMENT

a. General

Long after the U.S. Army had substituted webbing for leather in the soldier's individual equipment - cartridge containers, belts, etc., the Japanese continued to use only heavy leather for all of these items. Within the last 12 months, however, laminated canvas impregnated with rubber has replaced leather for practically every item. Belts, cartridges boxes, rifle slings and numerous other items have been captured, all made of laminated square woven fabric and impregnated with rubber to a varying degree.

b. Cartridge Boxes

The new cartridge boxes are especially noteworthy, in that they represent an ideal solution of a difficult problem. The material used in the box is laminated

[redacted]

canvas heavily impregnated with rubber and moulded into shape. The box top is of the same material but the center is a thick piece of pure rubber and the top is therefore somewhat flexible, permitting an unusually tight fit. This material is superior to leather, especially in tropical climates where leather is apt to rot. Other equipment was made up of fabric, of sufficient plies in thickness for the purpose intended, coated with rubber, and cured. Strapping and belting was cured flat; canteen covers and such items were cut to shape and cured over a mould.

c. Other Uses

The Japanese army is evidently plentifully supplied with rubber for any conceivable purpose. Heavy bags of pure rubber were used as food containers on Attu, and rubber boots and waders were of excellent quality.

GENERAL

19. GERMAN PORTABLE HAVERSACK FILTER

The Tornisterfiltergerät, a portable haversack filter, is standard equipment in the German army, and is issued on a company basis. The filter is said to be able to treat from 22 to 55 gallons of water per hour, according to the amount of solid matter contained. Although the Tornisterfiltergerat was designed primarily for clarification of water it is claimed by the Germans that this device will effectively treat water that has been contaminated by dead bodies and similar substances; however, it is expressly stated that the filter will not rid water of objectionable odors nor is it effective against water containing chemical warfare agents or substances in solution. Methods of water purification used by the United States and Japanese armies were described in Tactical and Technical Trends, No. 22, p. 33.

a. General

The gross weight of the filter and accessories is approximately 45 pounds. The whole assembly is packed in a canvas case, provided with two carrying straps so that it may be carried on the back, haversack-fashion. The assembly consists of two parts, viz., spares and accessories box shown at (1) in the accompanying sketch, and the filter; the box contains six pockets, each of eight spare filter pads; also a cleaning brush and instruction manual.

The filter consists of a chamber through which water is forced by means of a pump (2), actuated by a handle (3), the grip of which is hinged and can be set at right angles to the shaft, as shown. The pump is supplied with water through a reinforced rubber intake pipe (4), terminating in a metal strainer (5). The standard length of the intake pipe is probably about 6 feet 7 inches. Water is delivered to the filter chamber through the delivery pipe (6). The filter chamber is contained between a front plate (7) and rear plate (8) which are held together by four tie-bolts and wing nuts (9). The two lower bolts are hinged to the rear plate and they can

[redacted]

be swung outwards when the filter chamber is to be dismantled. The wing nuts can be tightened by means of a key (10) which is normally located on the bar (11). At (12) on the front plate is an air valve, with a safety valve (13) and (14) the water outlet. Inside the filter chamber are four screens (15), provided at one side with top and bottom annular porcelain projections which fit together when the screens are in position, forming a continuous water channel. Alternating with the four screens (15) are three frames (16), also fitted with annular porcelain projections. Between each screen and frame, and between the two outer screens and the front and rear plates, are eight filter pads (17).

b. Method of Operation

Water is sucked by the pump (2) into the strainer (5) and intake pipe (4), through the delivery tube (6), past the air valve (12) and safety valve (13) into the upper and lower channels formed by the porcelain projections on the frames (16). From each of these two channels three small openings (18), one in the center of each porcelain projection, lead to the inside of the frame; the water is forced through these and then through the filter pads (17) into the screens (15), where it goes into the upper and lower channels formed by the porcelain projections on the screens, and can be collected at the water outlet (14).

c. Method of Assembly

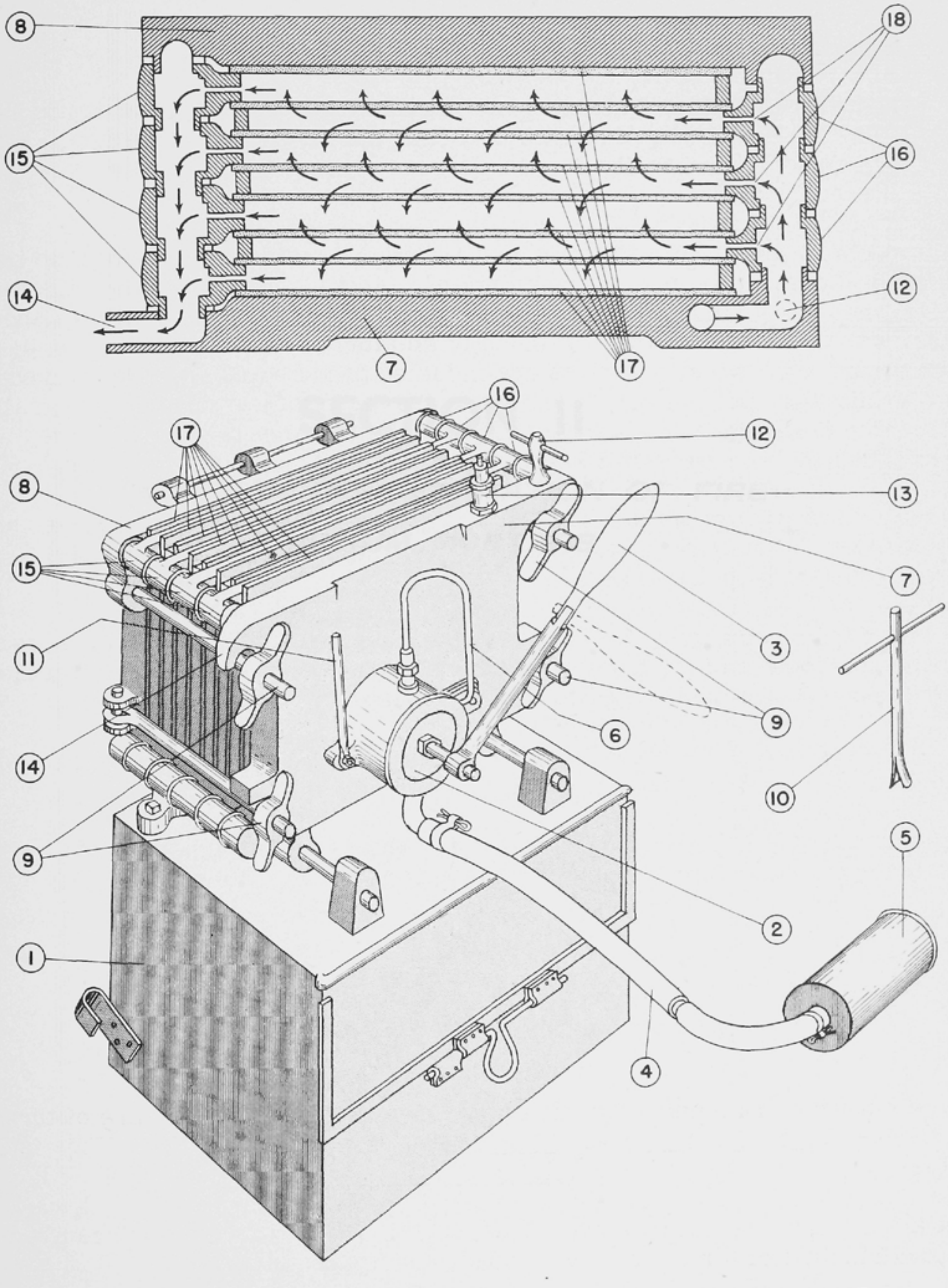
Remove and roll up the canvas-cover. Unscrew the 4 wing nuts. Move the 2 lower tie-bolts outwards. Pull the front plate (7) forward. Remove the screens (15) and frames (16). Insert 8 filter pads in position so that they rest on the cross bars on the lid of the spares and accessories box, so that the rough side of the pad faces toward the frame. Push back the front plate (7). Swing the 2 lower tie-bolts back into position on the front plate. Tighten the wing nuts, first by hand and finally with the key (10). Place the strainer (5) in the water, making sure that it does not sink into mud. Open the air valve (12) by putting the handle in the vertical position. Fix the grip on the pump handle (9) at right angles to the shaft, and begin to pump slowly. As soon as water issues from the air valve, close the valve and continue pumping until water begins to issue from the outlet (14).

d. Changing Filter Pads

Cease pumping. Open the air valve. Unscrew the four wing nuts. Dismantle the front plate, screens and frames. Remove, and if possible, bury the used filter pads. Carefully rinse down the front and back plates, screens and frames, then brush them, and finally rinse them again. Take eight new filter pads and insert them as directed in method of assembly instructions.

e. Care and Maintenance

After it has been used the filter should be dismantled, washed, and thoroughly dried. The strainer should be unscrewed, cleaned and reconnected. As soon as the parts are completely dry the filter should be reassembled without filter pads, the outer edges of the screens and frames covered with a thin layer of grease, and the canvas cover replaced.



GERMAN PORTABLE HAVERSACK FILTER

SECTION II

GERMAN CONCENTRATION OF FIRE--MEDIUM MORTARS

[redacted]

GERMAN CONCENTRATION OF FIRE--MEDIUM MORTARS*

The article which follows deals with the possibilities for concentrating fire and is confined to an explanation of the simplest methods. The directive embodying these details is in the nature of a supplement to the German Army Manual 104. (H. Dv. 104) 1940. No new aiming and firing procedures are involved nor is additional laying and firing equipment required.

Attention is particularly directed to the possibility of bedding-in the base plate and to the terms "voice control action" and "position correction."

The German thought here shows the tendency towards concentration of supporting fire, and though it purports to be a supplement to the Manual of 1940, it does, in fact, it appears, represent a considerable change in policy.

An American unit in the field compares the supplement and the earlier Manual as follows: "The earlier Manual considers that medium mortars should normally be sub-allotted in pairs to forward companies, and even foresees occasions when single mortars may be placed under command of infantry platoons; the control of medium mortars by the mortar platoon commander and their concentration at battalion level is regarded as exceptional whereas in the later supplement all the emphasis is laid upon concentration as the normal policy. Recent fighting has demonstrated the effectiveness of the new policy."

Since mortars are likely to be among our most formidable enemy weapons in the future, this whole account should prove of interest.

Where an English equivalent exists but differs from a literal translation of the German, the English equivalent has been preferred. The terms "section" and "section commander" have been used to translate the German "Gruppe" and "Gruppenführer" and mean respectively a section consisting of two mortars, and the NCO in charge of such section.

* * *

a. General

(1) Concentration of the fire of several mortars increases fire effect. The fire of one section, two sections or of a complete platoon may be concentrated, depending upon the tactical situation, the number of the targets, their nature, and the ground. When two sections or a complete platoon are engaged, the fire unit will be the section. The effectiveness of the concentration will be especially high if the target can be taken by surprise by a sudden hail of fire at maximum intensity.

(2) Platoon and section commanders must, therefore, continually strive to concentrate their fire on the most important targets not only at the beginning

*Translated from the German Manual "Richtlinien für die Feuerzusammenfassung mit s. Gr. Werfern" 8 February 1943.

[redacted]

of an attack but throughout its duration. Should a number of targets appear at the same time it may then be more effective to silence them one after another by the concentrated fire of the section, than to engage them simultaneously each with a single mortar. The platoon or section commander must decide (guided by the nature of the target, its breadth and importance, and the demands of the situation, or of his own troops) how, and in what order targets are to be engaged.

(3) Concentration of fire may also prove very effective in defense when directed on enemy OPs, machine-gun nests, assembly areas in dead ground, woods, outskirts of villages and so on; it may be the deciding factor in the repulse of enemy attacks. Platoon or section commanders must take all measures within the framework of the fire plan to ensure that the fire of their mortars can be concentrated on the maximum number of points.

(4) Sound intercommunication is essential for rapid concentration of fire--in the case of a section, between the section commander and his mortars, and in the case of two sections or the whole platoon, between the platoon commander and the individual sections.

In the first case, transmission of orders by relayed voice or remote control procedure will normally suffice. The provision of a line link from the section commander's OP to the mortar position, or to the OP of the second mortar is only necessary where considerable distances are involved owing to the nature of the ground or enemy activity, and will be the exception.

On the other hand, when two sections or the complete platoon are engaged, a line link will frequently be necessary from the platoon commander's OP to the section OPs. The platoon commander will detail the sections providing signals apparatus, and decide whether the link is to be laid and maintained by platoon HQ orderlies or by section personnel.

(5) Rapid and unhesitating target indication makes for quick fire concentration, and increases the flexibility of the fire. A given target may be indicated by:-

(a) <u>Pointing out on the Ground</u>

This method is the rule where a section is to engage. The section commander points the targets out personally to both detachment commanders in cases where he hands over fire control to them. Should he control a mortar himself, then in order to save time he will normally entrust the detachment commander of this mortar with the task of indicating targets to the other mortar.

When a complete platoon is in action, this method of target indication is only possible if the sections are close together. In general, the method is excessively lengthy, and as a result, the platoon commander will normally choose one of the following procedures according to the situation, and time available.

[redacted]

(b) Fire by the "voice control" section

In order to be able to control and, if necessary, concentrate the fire of several sections, or to bring the fire of one section quickly down onto a target, the platoon commander will site his OP within shouting distance of a section OP (i.e. the OP of the "voice control" section). Then, to indicate a target to the other sections, he orders the "voice control" section to fire on the target using one mortar. In this connection it should be noted that the element of surprise will be forfeited by the preliminary round. This method is therefore only to be recommended when engaging targets which cannot quickly move out of the fire (see paragraph 7 below).

(c) Named features

The platoon commander names a number of conspicuous topographical features distributed in breadth and depth over the battlefield in the presence of the section commanders:-

e.g. "right hand edge of wood", "haystack", "lone tree", "brown knoll". Any target appearing will then be described in relation to one of these reference points, or its distance in line from one of them given in terms of mils* measured by the binoculars:-

e.g. "machine-gun right hand edge haystack", or, "OP 50 mils left of the lone tree". This method is quick, and will be found convenient where speed is necessary, as for instance in the case of an encounter attack or while an attack is still in progress.

(d) Target key

The target key takes the form of a simple field sketch or panorama, in which conspicuous points are indicated by a capital J and a number**. The key is then distributed to sections. Indication of targets follows in accordance with paragraph 5 above. Fire orders will be determined and referred to in relation to individual J-points. The key must agree with the key in use by the unit to which the mortars are subordinated (company, battalion, etc.) This method takes time, and its use is, therefore, frequently confined to the deliberate attack and to defense.

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*A Mil is 1/6400th part of a circle and at any range subtends a distance of approximately 1/1000th of that range. There are approximately 18 mils to one degree.

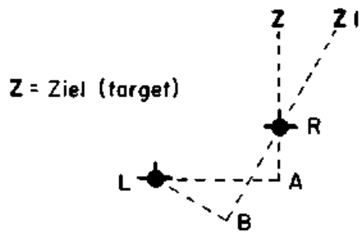
**The "J" indicates an infantry (German-Infanterie) target. German practice is to number targets from the right, using numbers from the block 100-199 for battalion support weapon targets, e.g. MMGs and mortars; and from the block 200-299 for regimental support weapons, e.g. infantry guns. German artillery proper adopts a similar system except that numbers are used without the letter prefix. Note: It is to be observed that originally the Roman J was a Gothic I (see H. Dv. 139/9, paragraphs 91, 92) derived from Infanterie, and may still be found in some documents.

[redacted]

(6) When fire is concentrated individual mortars will nonetheless be laid on the target or the allotted portion of the target area in accordance with the laying procedure given in Army Manual 104. Bunching and careless behavior during laying must be avoided.

(7) In order to retain the element of surprise when fire is concentrated, ranging will normally be carried out by a single mortar firing on a registration point (i.e. another target, or a feature in the vicinity of which the enemy is believed to be). This registration point must lie at approximately the same range as the target which is to be engaged, and should not differ from it in line by more than 300 mils*. A range finder is considerable assistance when firing on the registration point. As long as all mortar platoons are not equipped with this instrument, the platoon commander must obtain one on loan from one of the MMG platoons. Measurement of large variations in line using the binoculars requires much practice and should be frequently exercised on training.

(8) The other mortar in the section accepts the established range to the target and corrects it for position correction. Position correction is the distance in meters measured along the line of fire by which the second mortar of a section is either forward or to the rear of the first one.



In the above sketch the line R-A is the position correction of the left mortar in relation to the right one. Should large switches be made, then the position correction alters, as shown by the line R-B. In this case it must be worked out afresh.

The mortar position NCO estimates, or if sufficient time is available, paces the position correction. In order to do this he moves prolongation of the line Z-R counting his steps, until he reaches a point at which the left mortar appears to be at right angles. He adds this distance (in meters) to the ordered range for the right mortar. For example, if the ordered range for the right mortar is 1,200 meters, and position correction for the left mortar 55 meters, then the order for the left mortar will be "left 1,260." Should the second mortar be sited forward of the first one, then position correction must be subtracted from the range.

(9) Fire for effect, will normally be proceeded with only after the mortar has registered. When engaging fleeting targets, parties of troops in dead ground, wooded areas, or targets of considerable size, then shooting-in may be dispensed

*i.e. about 17 degrees.

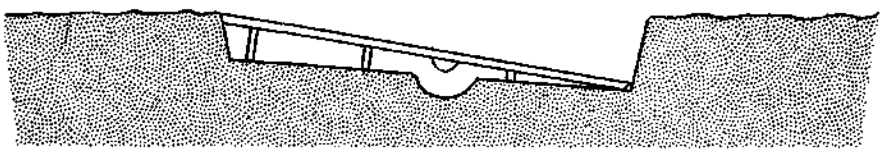
[redacted]

with if the situation demands it. When concentrating fire on large targets surprise effect or the necessity for conserving ammunition may make it expedient to register or shoot-in only one of the mortars.

(10) Bedding-in the base plate will minimize the disadvantages which arise when shooting with mortars which have not registered.

The following directions will be complied with when bedding-in the base plate:-

After the detachment commander has aligned the base plate in accordance with H.Dv.104, he will mark its dimensions on the ground and have the bed dug out. Its forward edge should be dug to a spade's depth* and the rear edge to half a spade's depth; this will produce a slope of 15 degrees (see sketch).



An additional depression will be made to correspond with the breech piece socket, and the rear edge of the base plate should be level with the surface before firing. The base plate will then be stamped in. Large stones, roots, etc., should be removed from the bed.

On loose, sandy soils with a grass or heather surface, the turf that has been removed should be used to make the bed.

If the ground is frozen or hard the bed should first be be broken up in order to prevent bounce, which makes shooting-in more difficult, and puts a severe strain upon the mortar.

On stony ground the bed should be dug deeper than usual and made up with earth or clay.

The construction of the bed takes from 3 to 5 minutes.

(11) When firing mortars which have not shot-in one must be prepared for a considerable dispersion of the first rounds, which may possibly also involve some short ones. This method should accordingly only be used when one's own troops are not situated too close to the target which is being engaged.

*The German entrenching tool is 8 1/2 inches long.

[redacted]

b. Concentration of Fire within the Section

(12) When preparing to concentrate his fire, or when actually firing, the section commander may either entrust detachment commanders with fire control, or himself control it.

(13) He will adopt the first course if the mortar positions are far apart. In this case the section commander merely indicates the target to the detachment commanders (or the relevant portion of the target, if the target is large), lays down the registration point for each mortar, should this be necessary, and instructs detachment commanders to report to him when ranging is completed. The detachment commanders carry out ranging individually and the section commander helps them out with observation. As soon as ranging has finished the detachment commanders switch onto the target line and report, e.g.,"Right mortar ranging complete. Mortar aligned on target."

According to the situation, the section commander may order both mortars to carry on with fire for effect either immediately after ranging has finished, or on his order. The amount of ammunition expended during fire for effect will depend upon the nature of the target and the state of ammunition supplies.

Should ranging have been carried out on registration points which differed considerably in line from the target, then if the situation permits, line and range to the target may be confirmed by a few rounds before fire for effect begins.

(14) Should the section commander himself act as fire controller, then he may either range both mortars one after the other, or only one of them. In the latter case the detachment commander who has been detailed to assist the section commander will range the other mortar while registration is proceeding. The base plate of this latter mortar may be bedded-in if the ground permits (see paragraph 10 above).

The mortar position NCO determines the position correction for the mortars.

As soon as ranging has finished, the mortar position NCO applies the necessary position correction to the range, and passes the result to the second mortar. The section commander then proceeds with fire for effect in accordance with paragraph 13.

c. Concentration of fire of Two Sections or of a Complete Platoon

(15) The section is the fire unit even when the fire of several sections is being concentrated. The section establishes the necessary data and carries out the engagement of the target in accordance with the platoon commander's orders.

(16) If the fire of several sections is to be concentrated, the platoon commander will site his OP at a point from which he can obtain the maximum uninterrupted observation over the battlefield. He details the section which he proposes to have close at hand as voice control section, and arranges communication

[redacted]

to the other sections. He makes suitable preparations for target indication, bearing in mind the time factor and the tactical situation (see paragraph 5 above).

(17) Concentration of the fire of the sections will be regulated both in space and time; regulation in space will be co-ordinated with the method of target indication and must be as simple as possible e.g.,"right section right half of target, left section left half of target." Section commanders will distribute the fire of the individual mortars.

(18) Limitation in time may be necessary on tactical grounds or for technical reasons--for instance, when ranging. Normally ranging will be in accordance with paragraph 7, which makes it possible for the platoon commander to lay down the registration points for individual sections.

The tactical situation may demand that sections range gradually, and at varying intervals, in order to preserve the element of surprise. In this case the platoon commander will order the time at which each section is to range.

(19) As soon as ranging is reported complete, the platoon commander will order fire for effect. This will be carried out in accordance with paragraphs 12-14. Simultaneous opening of fire by all sections in the case of surprise fire may be produced on the commander's order. The order will be passed, as the situation demands, by line, or by the fire of the voice control section. It can also be arranged on a time basis. If fire has to be brought down on the target at a certain time, the time of flight must be borne in mind.

(20) The platoon commander will observe the general pattern of each section's fire and report it to the relevant section, e.g.,"No. 1 section short", or "Left mortar No. 3 section shooting left 30 mils". The section commanders thereupon adjust their MPIs (main points of impact). The fact that the platoon commander is also observing does not, however, absolve section commanders of their duty of constantly watching their fire and making independent efforts to improve it.

(21) Concentration of the fire of several sections is facilitated if the mortar positions are sited as close together as the situation, task and ground permit. Under these circumstances, also, the section continues to be the fire unit. Ranging may occasionally be carried out by only a single mortar. In this case position correction must be applied to all the other mortars when firing for effect. However, should the mortars not have been shot-in, shooting-in may be omitted (see paragraphs 9-11).

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SECTION I

AIR

1. THE JU-188

A specimen of the Ju-188, twin-engine bomber, which is currently being encountered in small numbers over England, has been examined, and a number of probable differences from its predecessor, the Ju-88, are described below.

The nose appears to have been re-designed to accomodate the increased armament and provide better pilot vision, showing a smoothly curving line in place of the usual angular faceted nose and stepped-up windshield.

The wing span is believed to be approximately 72 feet 6 inches and the wing tips nearly pointed, although those of the stabilizer and elevators are square. The fin and rudder are higher and wider than the Ju-88 and square in appearance, resembling somewhat the Ju-87. A large trimming tab is a noticeable feature of the rudder. Some modification of the top line of the fuselage is effected by a power-operated gun turret which is incorporated in the cockpit, similar to the installation in the Do-217. The landing gear is of the standard oleo-pneumatic retractable type and the tail wheel is also fully retractable. The leading edge of the wings were fitted with balloon cable cutters.

The aircraft is powered by two BMW 801 G-2 14-cylinder aircooled radial engines, fully rated and fitted with three-bladed metal propellers. The fuel tank installation is the same as in the Ju-88 with a normal capacity of 446 U.S. gallons in the wing tanks. Possible additional capacity of 325 gallons in the forward bomb compartment and 181 in the rear bomb compartment gives a maximum supply of 952 gallons. The fuel of any individual tank may be jettisoned through the operation of a selector switch on the instrument panel. Performance estimates, which are approximately 15 per cent higher than corresponding figures for the Ju-88 equipped with Jumo 211 J engines, include maximum emergency speeds of 285 mph at sea level and 325 mph at 20,000 feet. Ranges, with 771 gallons of fuel are 800 miles at cruising speed of 254 mph and 1,200 miles with a weak mixture economical cruising speed of 232 mph. Service ceiling is estimated to be between 33,000 and 34,000 feet.

The armament is considerably more powerful than that of the Ju-88. There are two 13-mm MG 131s, one in a dorsal power-rotated turret with a perspex dome, similar to that installed in the Do-217, and the other in a manually-operated ring fitted with a bullet-proof glass shield in the dorsal rear of the cockpit. One 20-mm MG 151, with limited movement, is mounted in the nose and twin 7.9-mm MG 81s are installed in the ventral position, firing aft.

As the forward bomb compartment was apparently fitted with a long-range tank, the bomb load probably consisted of ten 110-pound bombs carried in the rear bomb compartment and two 2,200-pound and two 1,100-pound bombs in four carriers, two fitted externally under each wing. The bomb doors are operated by an electric motor, a new feature in German aircraft.

The armor found consisted of plate protection for the back, shoulders, and head of the pilot, a bullet-proof windshield for the radio operator, another

plate behind the radio set, and a curved plate on the floor.

The presence of A.S.V. (air-to-surface vessel apparatus) may indicate the use of the aircraft for antishipping operations.

The Ju-188 has participated in the recent hit-and-run raids over England and may be encountered by convoys in the near future.

ANTIAIRCRAFT

2. GERMAN 37-MM AA GUN

The German 37-mm (1.46 in) AA gun (3.7-cm Flak 18 and 36) is the smallest of the German medium AA artillery. In addition to the data published in "German Antiaircraft Artillery," MID Special Series, No. 10 (8 Feb 1943), the following information has become available.

a. Characteristics

Muzzle velocity (HE)	2,690 f/s
" " (AP)	2,625 f/s
Max horizontal range	7,200 yds
Ceiling	15,750 ft
Effective ceiling	6,560 ft
Weight in action (Flak 18)	1.72 tons
" " " (Flak 36)	1.53 tons
" draught (Flak 18)	3.39 tons
" " (Flak 36)	2.36 tons
Weight of complete round (HE)	3.3 lb
" " " " (AP)	3.5 lb
" " projectile (HE)	1.4 lb
" " " (AP)	1.5 lb

A preliminary examination of this equipment has been made and the following information obtained:

Length of barrel, including flash hider	128.75 in
Length of bore	71.2 in
Rifling	RH plain section, increasing 1 in 50 to 1 in 40
No. of grooves	20
Elevation	- 8° to + 85°
Traverse	360°
Rate of traverse, fast	35.5 turns = 360°
" " " slow	89 turns = 360°
Height of trunnions on ground	35.43 in

[redacted]

b. The Gun.

The gun has a monobloc barrel. The firing mechanism appears to be operated by barrel recoil and residual pressure of gas in a manner essentially similar in principle to the 2-cm Flak 38.

c. The Mount

The mount is of the trailer type and consists of two complete units-- the chassis and the mounting.

The chassis appears to be identical with that of the 2-cm Flakvierling 38, consisting of a U-shaped hollow rectangular steel frame mounted on 2 pneumatic tires.

The mount is a complete unit which is detached from the chassis by operating the 2 winches and dropping the front 2 pads; by depressing a locking handle at the rear the remaining pad may be freed by withdrawing the chassis.

(1) The base consists of a triangular platform on 3 adjustable supports by means of which the equipment may be levelled correctly. A spirit level is provided on the righthand side. A circular plate is fitted to the base on which the body rotates.

(2) The body is built up of a base and 2 roughly triangular side pieces which have a raised portion on each side for the trunnion bearings. On the left side is a lever by means of which the gun is pulled back. There are 3 adjustable seats, one on the right for the gunner, one on the left rear for sight number 1, and one on the left side for the loader. There is also a small folding platform on the left side. At the rear is fitted a dust tray.

(3) The cradle is trough-shaped and has a bracket at the forward end and a receiving slot at the rear to take the piece. The recoil mechanism is inside the cradle, recoil cylinder above, recuperator below. The elevating rack is in one piece with the cradle, and has fitted to it a scale reading from -8° to 85°.

(4) Compensators are fitted, consisting of 2 spring-loaded cylinders, one on each side.

(5) The traversing mechanism is operated by the left wheel of 2 parallel mounted handwheels, situated at the upper right rear of the body.

(6) The elevating gear is operated by the right wheel of the 2 handwheels.

(7) The firing mechanism operates by means of a foot pedal to the right of the layer's footrest connected by a system of levers to the trigger.

(8) The sight used on this equipment is known as the Flakvisier 36 "KF".

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GERMAN

37-MM ANTIAIRCRAFT GUN

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[redacted]

No complete specimen was available for examination but it is a fairly simple course-and-speed sight. Flakvisiers 33 and 35 are also used with the gun.

3. RUSSIAN AA ARTILLERY METHODS

Russian methods of repulsing enemy air attacks were recently outlined in an article published in the Red Star. A translation of the article follows:

* * *

The first enemy air raids were characterized by concentrated attacks on small targets. Dozens of Ju planes, one after another, made diving attacks on specific objectives, dropping their bombs on small areas. Under such conditions great endurance is required of the antiaircraft crews.

Intensive counterfire is necessary to prevent the success of concentrated enemy raids. In combatting one air attack our gun crews fired long salvoes at a definite point where the German planes went into their dives. If, however, the leading plane did succeed in getting through the wall of fire and dropped its bombs, the following planes were sure to get into the zone of fire. Following these tactics, one of our batteries brought down three bombers during the first day.

The Germans began to employ other tactical methods which were carried out at different altitudes. For instance, they made the so-called "star raids" in which the bombers approach the target from all directions. The Germans began to bomb large areas, attempting primarily to disperse our antiaircraft fire. The effectiveness of our antiaircraft artillery during such raids depends to a great extent on how completely reconnaissance is organized. Detecting enemy planes on time and destroying their combat formation before they drop their bombs is of prime importance. The antiaircraft gunners call this "saving a second of time".

In addition to the regular reconnaissance personnel, each crew in a battery has a constant observation post. In this way it has been possible to maintain reliable observation in all directions. To begin with, the men learned to identify the different German planes; they also learned to determine the speed of the Ju-87s and -88s with and without a bomb load.

The men were taught to determine, both with the naked eye and with instruments, the distance to enemy planes. This so-called "constant concentric observation" permits each battery to quickly maneuver its fire.

During the German "star raids" no attempt was made to score hits on all the attacking planes that appeared over the battlefield but instead attention was concentrated on those groups of planes which threatened most. On one occasion our battery threw up a wall of fire at a group of Ju-87s and forced them to change their course. At that very moment the observation post of one of our guns reported

[redacted]

six Ju-87s approaching from the rear. The crews immediately transferred their fire to this group, aiming, as is usual in such cases, at the leading plane. The plane caught on fire and went into a tail spin before the bombs could be dropped. This broke up the combat formation of the whole group and the enemy planes jettisoned their bombs and turned back.

In training the men and junior commanders, our higher officers paid special attention to developing ability in determining whether the enemy planes were continuing on their appointed course or were resorting to evasive antiaircraft maneuvers. The fire accuracy of small caliber antiaircraft guns depends largely on how well the course of the enemy plane has been determined.

In the majority of cases our battery employed dispersion fire, and always made sure that there was a line of shell bursts in front of the leading enemy plane. This was a psychological maneuver. In order to get out of the zone of antiaircraft fire, the pilot sometimes increases his speed but this is very difficult when he faces a continuous stream of fire.

ARMORED

4. GERMAN 6-WHEELED ARMORED CARS

German armored cars, in general, may be divided into three major classes: the 4-wheeled light (see Tactical and Technical Trends, No. 38, p. 10), the 8-wheeled heavy (see Tactical and Technical Trends, No. 32, p. 8), and the 6-wheeled medium. It is reported that the 6-wheeled vehicles are no longer being manufactured but inasmuch as many are still in use and unquestionably will be encountered in the European theater, the following information is presented.

The 6-wheeled armored car was produced in three basic types. It is believed that all types are similar in chassis design and that only the superstructure was modified in each type to meet its requirements.

The chassis and engine were built by Bussing-NAG and the superstructure added by Deutsche Werke, Kiel. Six-wheel drive is employed and the vehicle may be driven from either end, duplicate controls being fitted. Steering is by front wheels only.

The rear wheels are dual double wheels, sprung by half-elliptic leaf springs. Special gripper chains are available for fitting over the rear wheels, giving each pair on each side in effect, the function of a track. Slightly smaller wheels may be fitted outside the existing front wheels for the purpose of obtaining extra traction in soft ground. As the additional wheels are smaller than the normal front wheels they do not interfere with the steering of the car.

The car is powered by a gas engine of approximately 70 brake horsepower.

[redacted]

GERMAN 6-WHEELED ARMORED CAR, TYPE 232

[redacted]

Other details, applicable to all 6-wheeled types are:

Armor	Ranging from 5 mm to 15 mm in thickness
Ground clearance	
Axles	9 in
Belly	8 in
Wheelbase	
Between axles 1 and 2	8 feet, 3 in
Between axles 2 and 3	2 feet, 11 in
Track	
Front wheels	5 feet, 7 in
Rear wheels	6 feet, 7 in
Width of wheels	
Front	7 in
Rear	14 in
Performance	
Fording	2 feet
Maximum gradient	12 degrees
Stability, longitudinal	50 degrees
Stability, lateral	32 degrees
Maximum speed, approx	50 mph
Turning circle, outside	52 feet
Fuel capacity	22 gallons
Theoretical fuel consumption	
Roads	6.9 mpg
Cross-country	4.2 mpg
Theoretical radius of action	
Roads	156 miles
Cross-country	93 miles

Following are individual descriptions of the three types of vehicles:

a. Sd. Kfz.* 231

This car mounts a 20-mm automatic cannon and a M.G. 34 (7.92-mm--.31-inch) coaxially in the turret with 360° traverse. A small radio set, employing a rod-type aerial, may be fitted. An attachment which permits a machine gun to be used in an antiaircraft role is fitted to the roof of the turret. A crew of 4 is carried. The car weighs approximately 5 1/4 tons unloaded, and approximately 6 tons loaded. It is 18 feet 5 inches in length, 6 feet 1 inch in width, and 7 feet 4 inches in height.

b. Sd. Kfz. 232

This type mounts the same armament as the Sd. Kfz. 231 but it is definitely known that it is equipped with radio. The vehicle is surmounted by a grid type

*sonder Kraftfahrzeug -- special motor vehicle

[redacted]

aerial lying in a horizontal plane and held in position by two struts at the rear of the car and a pivot coupling on the top of the turret. The aerial extends from the rear to two-thirds of the way to the front of the vehicle and is curved down slightly at the rear and front. The turret can still traverse through 360° but it is limited in that the guns may shoot the aerial away when firing over the rear of the vehicle. There is no antiaircraft mounting. A crew of 4 is carried.

The weight of the vehicle is approximately 5 1/2 tons unloaded, and slightly over 6 tons loaded. It is the same as the Sd. Kfz. 231 in length and width but is 9 feet 6 inches in height.

c. Sd. Kfz. 263

This type has a fixed turret with one machine gun firing forward. It is equipped with radio. A grid aerial is fitted, mounted on 4 struts, no pivot coupling being necessary above the turret. There is no antiaircraft mounting. The crew numbers five. The car weighs slightly over 5 tons unloaded, and slightly under 6 tons loaded. It is 18 feet 4 inches in length, 6 feet in width, and 9 feet 6 inches in height.

5. GERMAN FLAME-THROWING TANK, PZ KW 2 (F)

The German flame-throwing tank has been discussed in the Intelligence Bulletin No. 9, p. 62, but not until recently has an accurate illustration or diagram of the vehicle become available. This apparatus consists of 2 large flame throwers mounted on the front ends of the trackguards of a PzKw 2 tank--the 30- to 34-mph, 12-ton vehicle with a radius of perhaps 155 miles--now used largely for reconnaissance purposes.

a. General

The fuel capacity for the flame throwers is about 35 gallons each--sufficient for about eighty projections of 2 or 3 seconds duration. Compressed nitrogen provides the propellant, and a tank of either acetylene or hydrogen is placed behind the projector for the igniting gas. Refuelling the flame throwers takes from one half hour to an hour. While the range of the flame throwers is not known, it is thought to be about 30 or 35 yards, which makes the tank a close assault vehicle, although the armor protection for such a purpose is not impressive. The armor, reported to be proof against 25-mm weapons at 656 yards, suggests frontal armor of 20 + 15 mm. (.79 + .59 in) although another source gives a single thickness of 30 millimeters or 1.18 inch. A machine gun with 1,800 rounds of ammunition is mounted in the revolving turret.

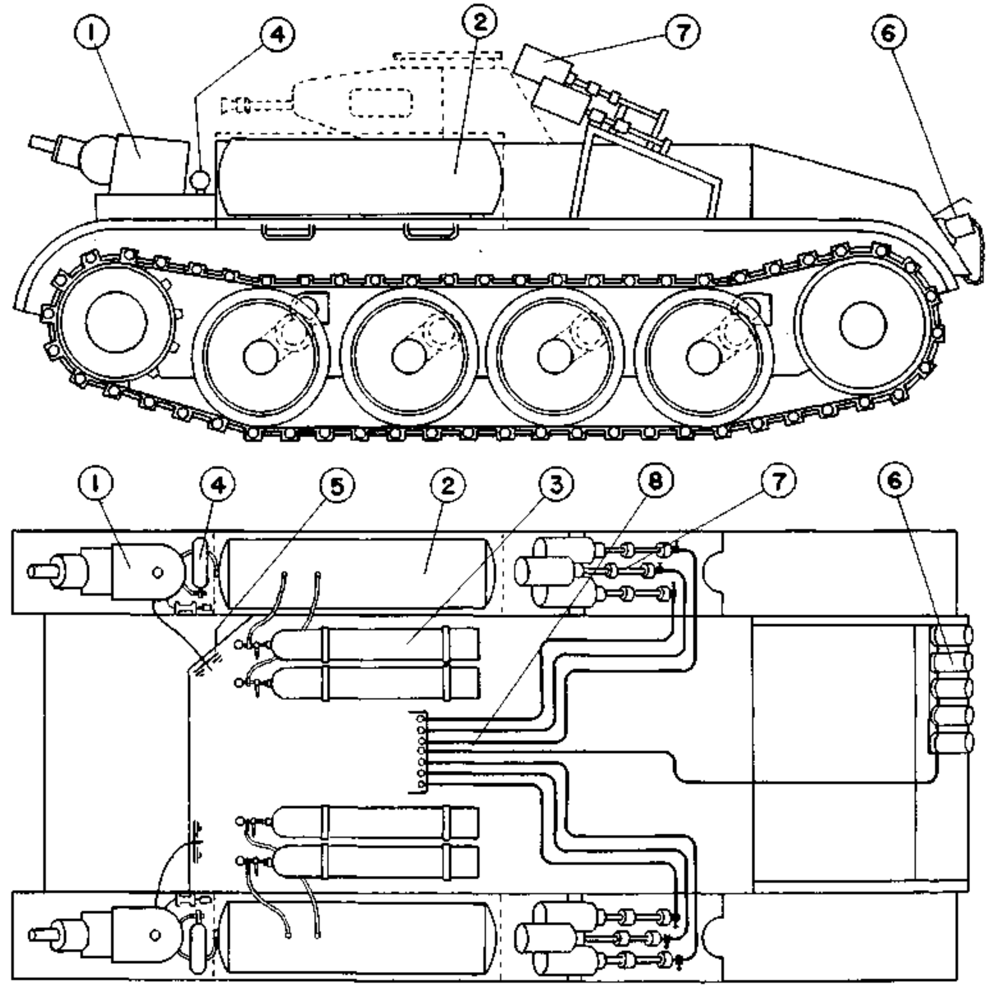
b. The Chassis

The chassis employed is that of the PzKw 2, either D or E, which are easily recognizable by their 4 large bogie wheels, each touching both the top and

[redacted]

bottom of the track. The tracks are of a different type from those fitted to the PzKw 2, model F, and have a much greater pitch--6 3/4 inches as against 3 5/8 inches.

The flame-thrower tank, PzKw 2 (F) Sd. Kfz.* 122 (this is the old Model B)



GERMAN FLAME THROWER TANK

PzKw 2 (F)

should not be confused with the PzKw 2 model F which is a normal type chassis having 5 medium-sized bogie wheels and 4 return rollers. The flame-thrower type of chassis appeared in 1939 with a normal armament, a 20-mm gun and a

*sonder Kraftfahrzeug--special motor vehicle

[redacted]

machine gun mounted in the turret, but is no longer seen in this form.

c. Flamethrower Equipment

The layout of the flame thrower is shown in the lower of the accompanying sketches. The flame thrower projectors (1) are mounted externally on the front of track guards, protected by armored shields, with a traverse of 180 degrees. The fuel is supplied from two tanks (2) mounted externally on the track guards and provided with armored shields, with the nitrogen gas for propulsion drawn from four cylinders (3) located inside the tank below the turret. Two small cylinders (4) mounted just behind the projector turrets contain the ignition fuel--acetylene or hydrogen. The flame throwers are controlled electrically from panels (5) in the turret.

d. Smoke Equipment

Since this tank is a close combat weapon, it is fitted with a smoke generator rack (6) attached to the rear; but on each track guard behind the fuel tanks are triple smoke generators and dischargers (7) aimed to fire forward by means of the cables (8) controlled from the turret.

ARTILLERY

6. GERMAN USE OF CAPTURED 120-MM MORTARS

It has been established that certain German units are being equipped with 120-mm mortars. In one instance the mortars are known to be Russian. It is possible, however, that the Germans will also use the French "Brandt" or the Finnish "Tampella" mortars. Brief data on the Russian, French (Brandt) and Finnish (Tampella) mortars are as follows:

	Russian	Finnish	French
Weight in action	588 lbs	560 lbs	1,792 lbs
Mounting	Bipod and baseplate	Bipod and baseplate	Fired from 2-wheeled carriage and baseplate
Method of firing	ML, percussion fired	ML, percussion fired	ML, trigger fired
Weight of bomb	35 lbs	27 1/2 and 47 1/2 lbs	37 lbs
Types of bomb	H.E.	H.E. and Smoke	H.E. and Smoke
Maximum rate of fire	-	12 rpm	6 rpm
Maximum range	6,500 yards	7,550 yards	8,000 yards
Carriage	2-wheeled, rubber tired	2-wheeled, rubber tired	-

[redacted]

7. GERMAN 128-MM SP GUN

A brief and not too satisfactory account of a brand-new, rather mobile, German 128-mm SP gun has been supplied by an allied source. The gun-caliber is a newcomer in the list of German artillery, and appears to be one of the ultra-modern long weapons which have been recently turned out by the Rheinmetall Company. No specifications are yet available concerning it.

Present data indicate the gun-and-mount assembly is an improvement on the rather cumbersome, 70-ton "Ferdinand", which mounts only an 88-mm (3.46 in) weapon rather than the new 128-mm (5.03 in) piece, and carries massive hull armor running from 4.33 to 7.87 inches (see Tactical and Technical Trends No. 35, p. 16)--a plating heavier than that carried at sea by most heavy naval cruisers. The hull armor on the 128-mm gun varies from 30 to 45 millimeters (1.18 to 1.38 in) over the fighting compartment and 15 to 30 millimeters (.59 to 1.18 in) on the lengthened PzKw 3 hull and chassis. The weight is thereby cut to about 35 tons and the speed has been stepped up from the 6 to 9 mph of the "Ferdinand" to about 15.5. Whether the added mobility is justified at the cost of stripping down the armor to a thickness that may be pierced by many small-caliber antitank guns, is an open question, and is certainly a reversal of trend. Perhaps "Ferdinand" was too massive to be thoroughly practical in mobile warfare. It is believed that the "128" may be used for the most part against fixed fortifications, in which case protection would be supplied by other means, which is further indicated by the fact that no machine gun is reported as part of the equipment. Only 18 rounds of separate-loading ammunition are carried. While the type of shell is not yet reported, mixed AP and anticoncrete projectiles may be expected. The crew is five.

CHEMICAL WARFARE

8. JAPANESE FLAME THROWER TYPE 93 (MODIFIED)

The Japanese Type 93 modified flame thrower is very similar to the small flame thrower of the same type number (see sketch) described in Tactical and Technical Trends No. 18, p. 8. For the sake of simplicity in comparison, the flame thrower described in this article has been designated "Type 93 Modified". It is not known whether this is a later or earlier model of the Type 93 or even an entirely separate type. However, the shorter length and slightly lighter weight of the nozzle of the modified model plus other mechanical improvements discussed below indicate that it is probably a later model.

The fuel tanks and rubber hoses of the two models are identical. The differences are found in the nozzle assemblies as shown on the following page.

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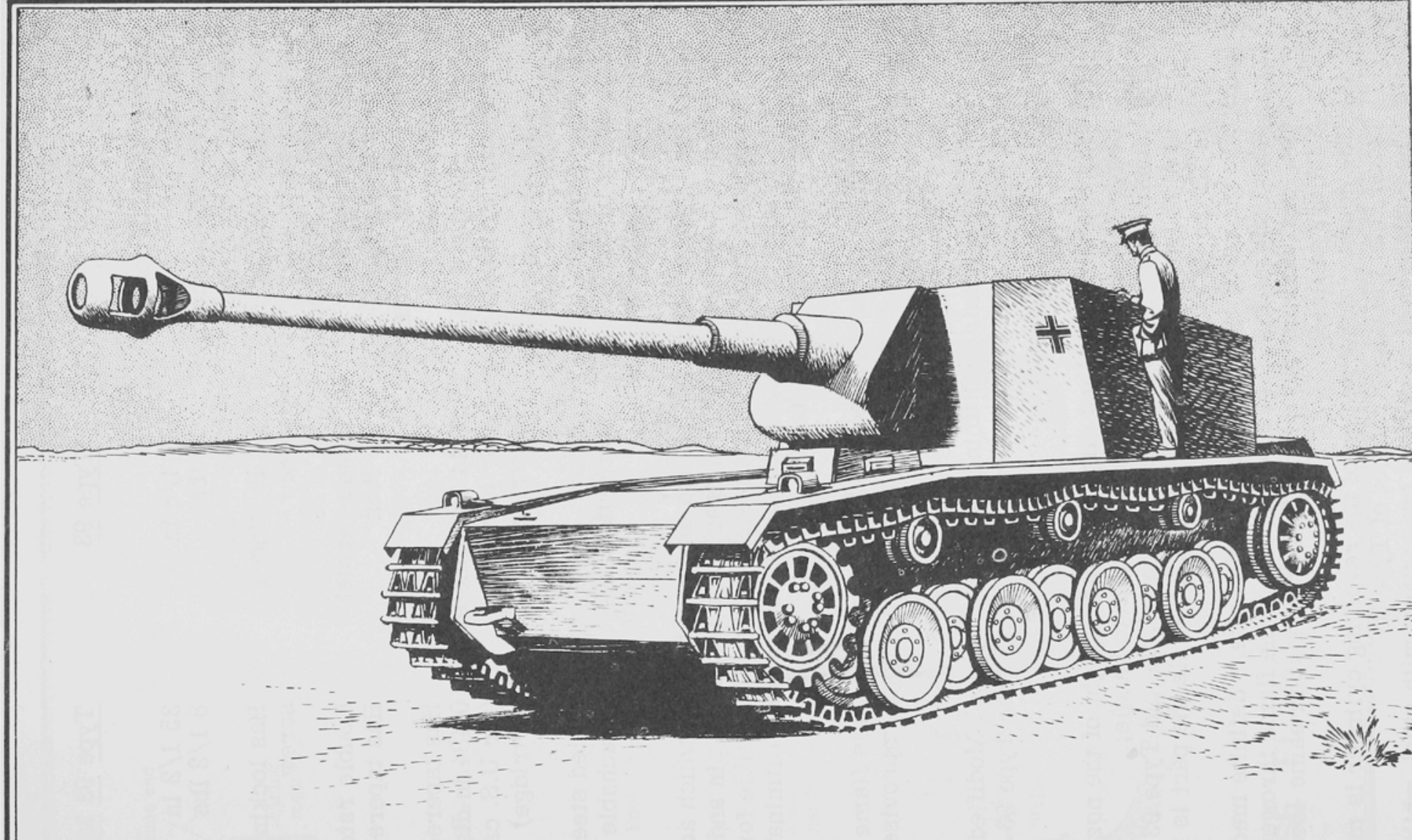

GERMAN 128-MM SELF-PROPELLED GUN

	Type 93	Type 93 Modified
Overall length of nozzle assembly (1)	47 1/8 in	35 1/2 in
Weight of nozzle assembly	10 lbs	8 1/2 lbs
Retaining nut on firing mechanism (inside nozzle outlet)	No locking screw	Has locking screw
Ratchet track (2) on back of revolving cylinder	Single ratchet	Double ratchet
Nut (3) on firing handle	No lock	Has tapered locking pin
Nut (4) on firing mechanism operating crank	No lock	Has tapered locking pin
Cartridge chambers (5) in revolving cylinder	0.44 in diameter (for Japanese cartridge)	0.484 in diameter (for U.S. cal. .30 cartridge)
Firing handle, fuel pipe and other fittings	Brass	Plated steel
Nozzle outlet tip (6)	Not detachable	Detachable

On the "Type 93 Modified" flame thrower, the pin, which actuates the revolving cylinder, operates in the inner track, and the firing pin and locking pin operate through the outer track. This feature makes it possible for the slots in each track to be tapered in opposite directions and thereby eliminates some wear on the locking pin and the track itself.

It is very likely that subsequent to the capture of this flame thrower the chambers were enlarged to permit the use of a cartridge improvised from U.S. caliber .30 cartridge cases.

The following points tend to indicate that "Type 93 Modified" flame thrower is an improvement or a more recent model of the Type 93 previously reported:

(1) The shorter length and slightly lighter weight of the nozzle give it a better balance, making it much easier to handle;
(2) Should the nozzle outlet tip be damaged, the old Type 93 nozzle would have to be sent to the rear for repair, while the part is replaceable in "Type 93 Modified."
(3) The inclusion of several locking pins offers definite mechanical and safety advantages. (In a recent test of the flame thrower not so equipped, the retaining nut on the firing mechanism came loose, resulting in a failure to fire.)
(4) The double ratchet design of the revolving cylinder is mechanically better than the single ratchet of Type 93.
(5) The replacement of various brass parts with steel, while not an advantage, may indicate a more recent date of manufacture.

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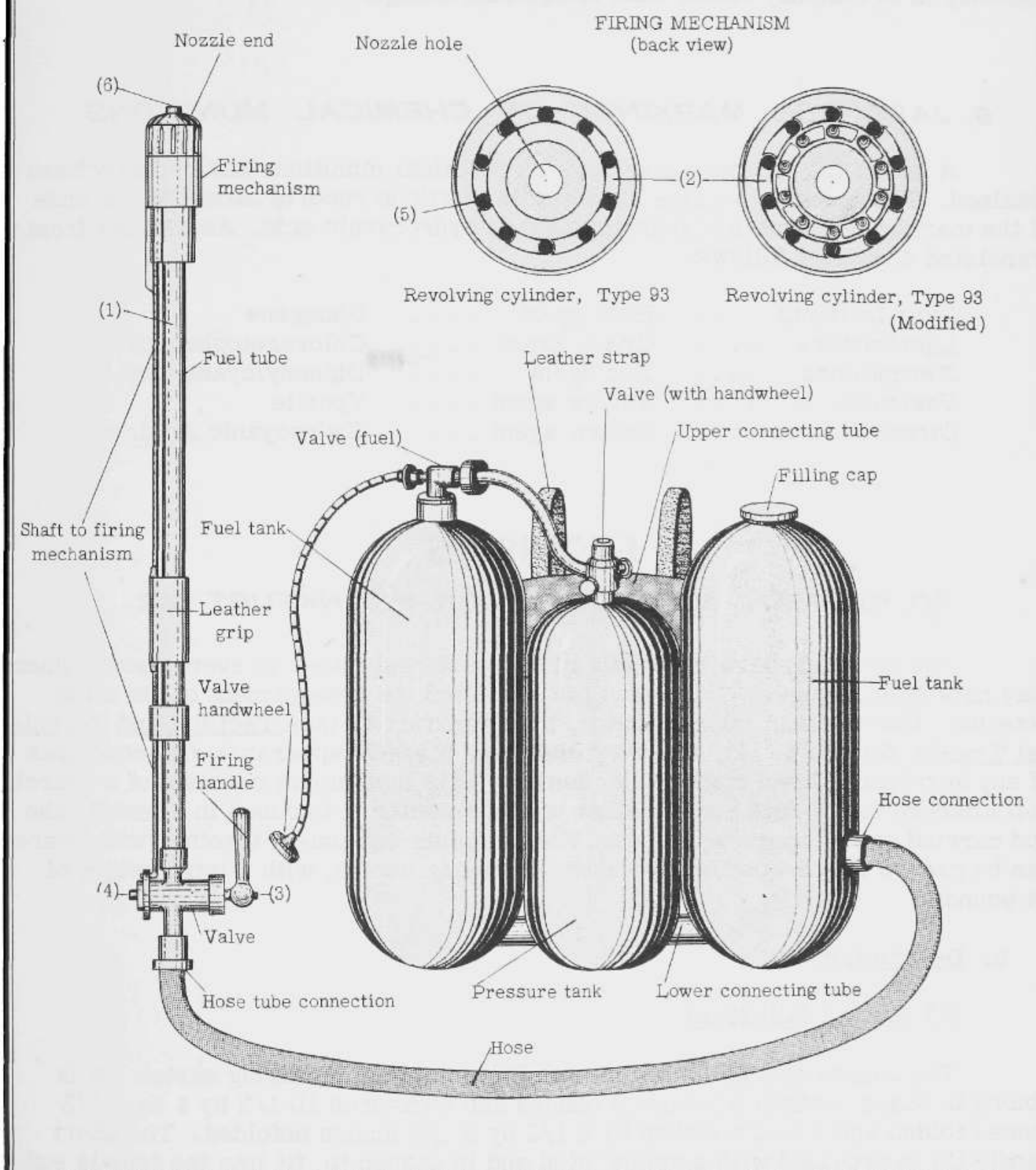


JAPANESE FLAME THROWER TYPE 93 (MODIFIED)

Conversely, most of these features involve added machine work and the present tendency is to simplify rather than complicate design.

9. JAPANESE MARKINGS ON CHEMICAL MUNITIONS

A list of the Japanese markings on chemical munitions has recently been obtained. The marking scheme agrees with previous reports except in the case of the marking for systemic poisons such as hydrocyanic acid. An extract from the translated document follows:

Lung Irritants	Blue agent	Phosgene
Lacrimators	Green agent	Chloracetophenone
Sternutators	Red agent	Diphenylcyanarsine
Vesicants	Yellow agent	Yperite
Direct Poisons	Brown agent	Hydrocyanic Acid.

ENGINEERS

10. GERMAN MINE DETECTOR--FRANKFURT 42

The Germans have made effective use of land mines in every sector where they have been engaged. They have not neglected the development of the mine detector. One German mine detector, the Frankfurt 42 (see Tactical and Technical Trends, No. 24, p. 14), is a very elaborate piece of apparatus, no economies of any sort having been made in the design. This instrument consists of a search coil attached to a 7-foot arm together with a detector set housed in a metal case and carried on the operator's back. The complete equipment together with spares can be packed into a wooden case with a carrying handle, with a total weight of 54 pounds.

a. Description

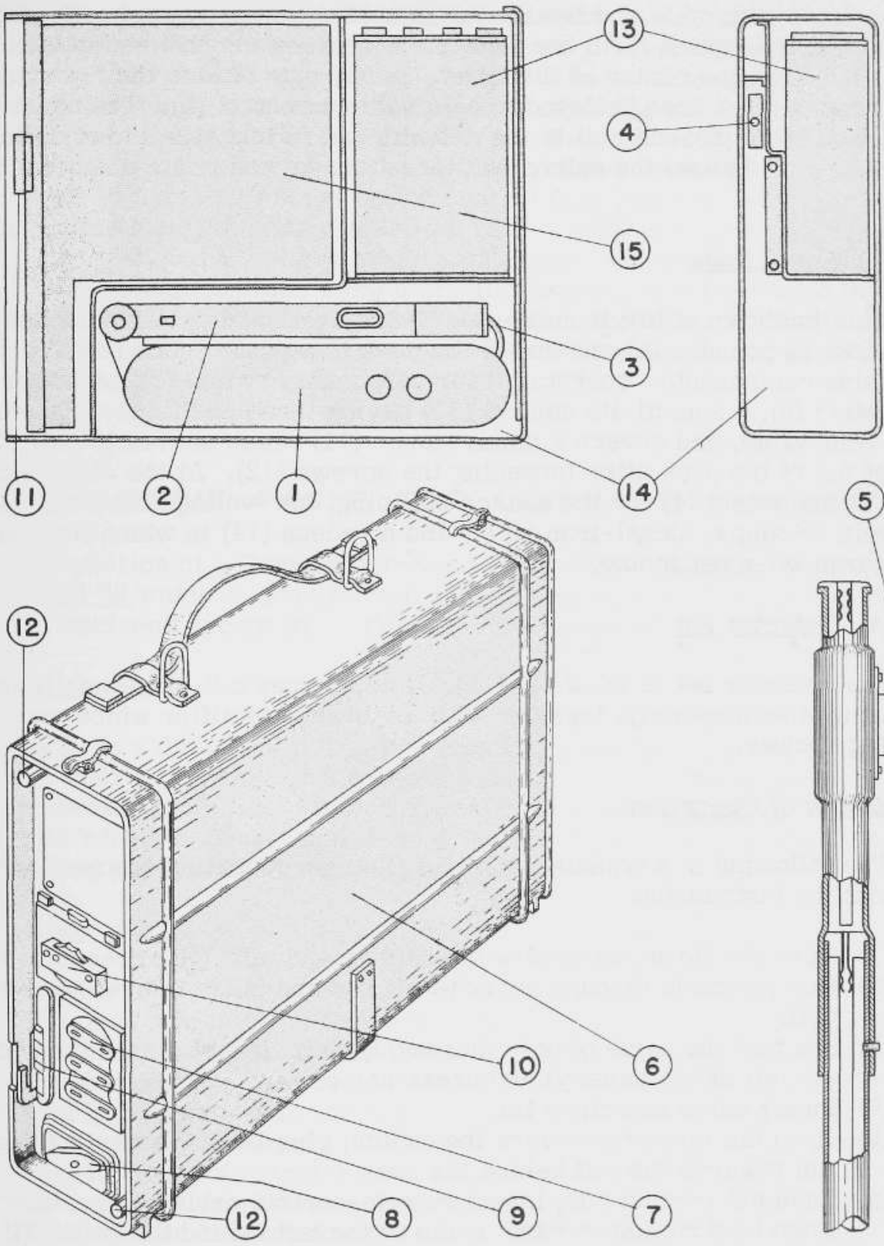
(1) Search Coil Head

The search coil head is shown at (1) in the accompanying sketch. It is oblong in shape, weighs 3 pounds 6 ounces and measures 10 1/2 by 4 by 2 1/2 inches folded and 1 foot 8 inches by 2 1/2 by 2 1/2 inches unfolded. The short handle (2) is provided with a spring stud and is shaped to fit into the female end of an extension piece; it folds over the coil as shown in the drawing for ease in stowage. A porcelain plug (3), fitted onto the end of the handle (2) for stowage, is provided with a lead which connects at (4) the search unit to the detector pack.

(2) Extension Pieces

The search coil is carried at the end of a 7-foot rod made up of 3 duralumin

[redacted]



GERMAN FRANKFURT 42 MINE DETECTOR

[redacted]

extension tubes with male and female joints held together by spring-loaded studs. The cable and plug which form the connection between the coil and detector set are threaded down the center of the tubes. In one type of arm the top extension piece carries a pivot knob believed to be a volume control (5). The exact method of connection of the search coil to the detector set in this type is not definitely known. When not in use, the extension pieces are packed in a cylindrical canvas case.

(3) Metal Pack

This is shown at (6); it measures 13 3/4 by 11 3/4 by 4 1/4 inches and weighs about 15 pounds. At one end of the pack is a control panel which carries the following components: sockets (7) for earphones, switch (8), indicator (possibly ammeter) (9), a sensitivity control (10) having three positions. The control panel is removable, and covers a small handle (11) which serves to pull the detector set out of the pack after loosening the screws (12). At the other side of the pack is the socket (4) for the search coil plug, low-voltage batteries (13) (two, 4-volt, 28 amps, nickel-iron type), and a recess (14) in which the search coil is stored when not in use.

(4) Detector Set

The detector set is shown at (15). It comprises a 2-valve oscillator and 2-valve amplifier assembly, together with a vibrator rectifier which supplies high voltage power.

b. Method of Operation

The following is a translation of the German operating instructions enclosed with the instrument:

(1) Open the lid which covers the battery and take out accessories.
(2) Run the cable through search-coil rod and place the rod on the search coil.
(3) See that the cable plug is thoroughly dry. Insert it into the socket (to left of the battery) and press home.
(4) Insert cable and close lid.
(5) Open the lid which covers the switch, plug in earphones and lead cable out towards the left behind the hook.
(6) Take out control box, insert remote-control cable and replace box. Then lead remote-control cable to the left behind the hook. (If it is intended to work with only one predetermined range of sensitivity the control box may remain in the case.)
(7) Put on lid and close.
(8) Attach back support from below.
(9) Place the apparatus in the back support and canvas carrier and sling over the shoulder. Put on earphones. Fix the control box to the belt;
(10) Turn switch to the right to position "Ein" (one).

[redacted]

(11) Grasp search coil and hold it in the air; only a high pitched singing note should be audible. The real lower pitched signal occurs only if the search coil approaches a metallic body. If the signal is audible beforehand, it can be eliminated by adjusting the screws on the search coil by means of the key fixed to it. Keep the search coil well clear of buckle and other metal parts. The greater the sensitivity used (it can be adjusted in 3 steps on the control box) the more exact is the zero adjustment; the more exact the zero adjustment the better the detection. If the signal increases while approaching the ground (for instance, if the ground contains iron) a smaller sensitivity range must be chosen.

(12) Search by slowly moving from side to side close to the ground. When the search coil passes over metallic bodies the signal increases in volume.

11. ADHESIVE PASTE FOR DEMOLITION CHARGES

A translation of a German document describes a substance known as Kat (Kaltklebekitt) 39 which is used for the speedy attachment of demolition charges to all kinds of surfaces except those that are thoroughly wet.

a. Description

Kat 39 is a dark brown, sticky substance made up in 1/2-kg tins with a spatula and instruction sheet. It will not adhere to wet surfaces under water. It must be protected from frost, which makes it hard and useless until it is thawed. It retains its adhesive properties as long as it is at body temperature. It can be stored for long periods and is unaffected by weather.

b. Method of Use

The side of the charge which is to be attached to the target is smeared with a 1/16- to 1/8-in layer of the paste and the charge pressed firmly against the target with a slight back and forward motion. If the surface to be attacked is wet or excessively damp it should be previously dried with a cloth. All charges attached with Kat 39 should in addition be secured with wire if time permits, as it is impossible to ascertain whether the whole or only part of the surface is adhering. Only in cases of extreme emergency, and if the demolition is to be carried out immediately, can the wire be omitted. Kat 39 can also be used to join a number of 200-gm or 1-kg slabs together to form concentrated charges, (geballte Ladungen;) these too must be further secured by wire. Heavy charges can be prevented from slipping down by lengths of 3/4-inch plank stuck to the surface of the target below the charge.

[redacted]

12. GERMAN WOODEN BOX MINE 42

The following information concerns a new type of mine which was first encountered in Sicily and which will probably be used by the enemy in other theaters of war. It is difficult for U.S. mine detectors to detect this device at a distance of 6 to 8 inches under normal conditions.

The German designation of the mine is "Holzmine 42" (wooden mine, 1942 pattern). Although the mine appears to be of base workshop manufacture, it has probably been constructed according to generally issued specifications. This surmise is given credence by the fact that it is described in detail in Italian documents.

Drawings of the Holzmine 42 which accompany this article are reproductions of drawings in the Italian printed material. However the reproductions have been slightly modified in a few details to conform with the dimensions of the 200-gram prepared charges -- Sprengkorper 28 (detonating charge)--which are used as primers. Both the accompanying illustration and description must be regarded as provisional. Definitely accurate information will be presented as soon as it can be obtained.

a. Description

(1) Casing

The mine is contained in a wooden box (1) of 5/8-inch boards, measuring 13 inches by 16 inches, external dimensions. The box is sub-divided internally into 4 compartments, of which the 2 at the sides contain the main explosive charge (2), while the central compartment (3) contains the primer charges, and the end compartment (4) the operating mechanism. The central compartment contains 2 small wooden blocks, one (5) fixed to the front (in some cases replaced by a leaf spring) and the other (6) to the back; these serve to hold the primer charges firmly in place.

The two slats (7) are removable. The end compartment (4) contains a shear flange (8) secured to the outside wall by two 3/8-inch wooden dowels; this flange is provided with a central slot (9) which receives the head of the igniter. A second wooden block (10) at the base of the inner wall supports the pressure block (11) while the mine is being transported. A pocket for the igniter is formed by two parallel pieces (12) and a slot in the partition (13). The lid (14) measures 13 inches by 12 3/4 inches. It is secured to the mine at front and back by metal hooks (15) and is located by side dowels (16). At one end is a rectangular hole (17) for the pressure block (11), and at the other end a handle (18). Two small pieces of wood (19) are provided on the underside of the lid; their exact purpose is not known. The pressure block (11) measures six inches by two and four-tenths inches by two and four-tenths inches and carries two locating pieces (20) which, when the mine is armed, rest on the shear flange (8), in which position the head of the pressure block projects about two inches above the lid. When the mine is being transported the pressure block is reversed so that the locating pieces rest on the block

[redacted]

(10): in this position the pressure block protrudes about three-quarters of an inch.

(2) Filling

The main filling consists either of two charges of 50/50 amatol, each of approximately five pounds and five ounces, in the compartments (2) as shown in the illustrations, or of 22 standard 200-gram prepared charges, in which case the slats (7) are removed. In specimens found in Sicily the main charges were covered with pitch, presumably as water-proofing.

The primer charges are situated in the central compartment (3), and appear to consist normally of three 200-gram charges, of which one or two may be replaced by blocks of wood.

(3) Igniter

This is described in a report from Sicily as consisting of a bakelite tube, two-and-a-half inches long by a half-inch in diameter, containing a spring-loaded striker. The metal striker spindle has two holes, of which the one at the end is probably designed to hold a ring, while the inner one takes the "winged" actuating pin. A brass nipple with washer is screwed into the other end of the casing so as to permit it to be screwed into a prepared charge.

(4) Anti-Lifting Devices

At (22) are holes in the base of the mine through which, presumably, igniters can be screwed into explosive charges, their other ends being anchored to the ground. The report from Sicily states "there may be as many as five prepared charges, all of which may be actuated"; this presumably includes the main primer charge with the igniter. To insert an anti-lifting igniter into one of the charges in the center compartment (3) the position of the charge would have to be changed so that the igniter socket lies downward, in which case there would only be room for two charges in the compartment instead of three. It was reported from Sicily that of the mines encountered in one area, 35 per cent were fitted with anti-lifting devices.

(5) Dimensions

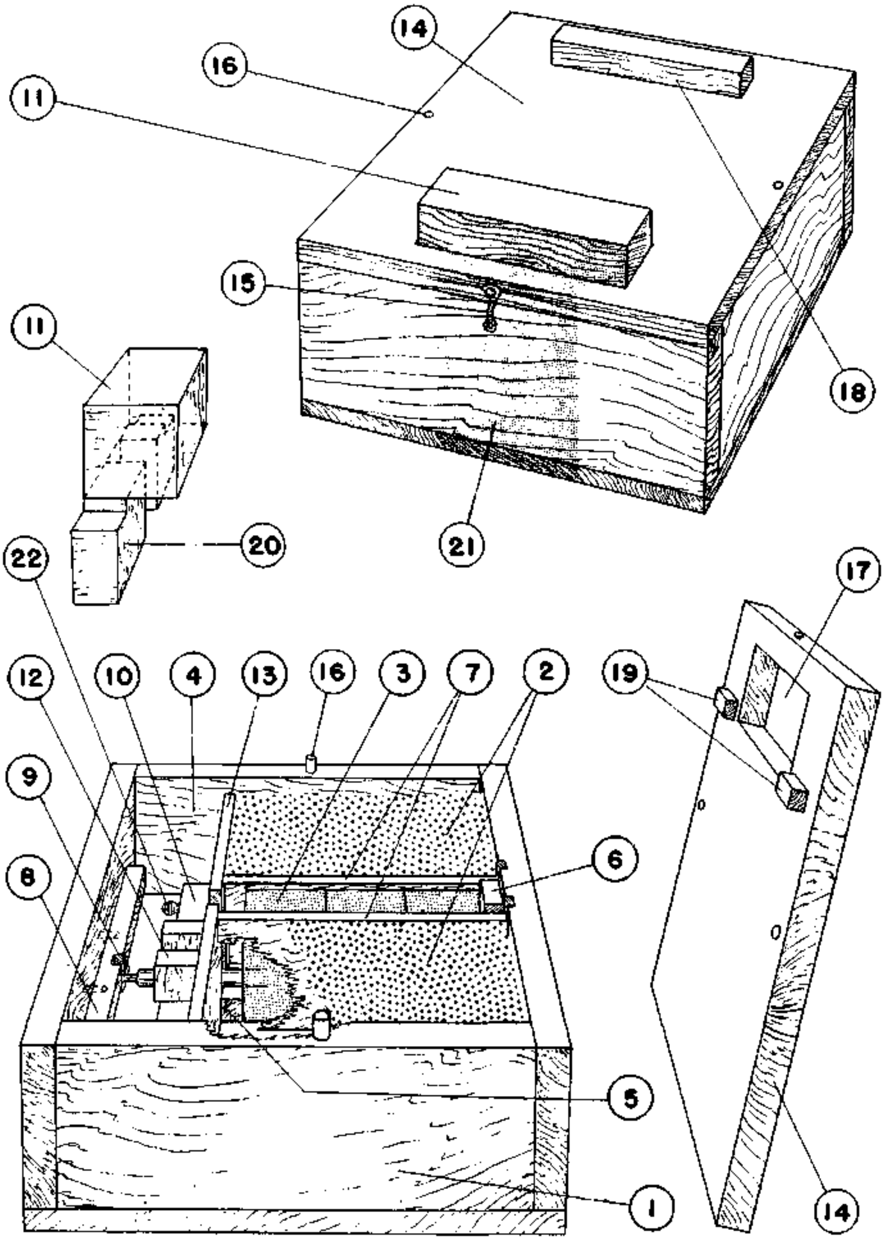
The report from Sicily gives the following figures:

Total weight of explosive	11 1/2 pounds
Total weight of mine	18 pounds

(6) Coloring and Markings

A vertical red band (21) is painted down the center of one end of the box, and is continued on to the lid. The side of the pressure block (11) facing this band is also painted red. The mine is marked as follows:

[redacted]



GERMAN WOODEN BOX MINE 42

[redacted]

I
HOLZMINE 42
bestehend aus
zwei Ladungen zu je etwa 2.4 kg. Fp. 50/50
zwei Füllkörper o. Bohrung
einem Sprengkörper 28 m. Bohrung
gue
eingehörige Zündungen in besonderem Packgefäss.

(Translation)

I
WOODEN MINE 1942 PATTERN
consisting of
two charges each of approximately 2.4-kg 50/50 amatol,
two explosive charges without igniter socket,
one 1928 pattern 200-gm charge with igniter socket,
relevant firing assembly in a special packing container.
(The meaning of the word "gue" is not known.)

b. Method of Operation

Pressure on the pressure block (11) shears the 3/8-inch dowels securing the shear flange (8) to the outer wall and forces the flange down on to the sides of the igniter actuating pin, which withdraws from the igniter and frees the spring-loaded striker.

c. Firing Pressure

It is reported from Sicily that the mine will fire under a pressure of 200 pounds. The Italian document states that pressure of from 440 to 600 pounds is required. However, the diameter of the shear dowels indicates that in all probability a pressure of 200 pounds is sufficient to cause explosion of the mine.

d. Method of Laying

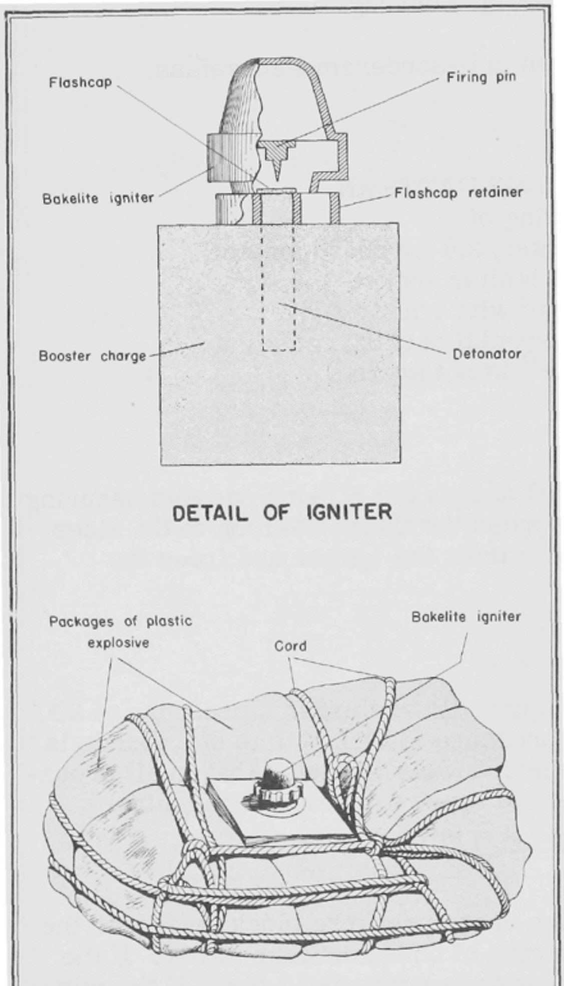
The mine is usually laid with the top of the pressure block level with the surface of the ground, with a minimum spacing of 6 feet between mines. If the mine must be laid on the surface, spacing between mines is 13 feet. If the mine is laid in water or in damp ground, it deteriorates quickly.

e. Disarming

Remove the lid, being careful to exert no pressure on the pressure block. Then lift the pressure block clear of the shear flange; examine the mine for anti-lifting devices. Unscrew the igniter and carefully remove the primer charges.

13. IMPROVISED PLASTIC MINE

Discovery of a new, non-metallic mine, which is difficult to detect and has been laid within allied positions by infiltrating German troops, has been reported.



DETAIL OF IGNITER

GERMAN IMPROVISED PLASTIC MINE

The mine, obviously improvised, contained no metal other than the aluminum cap and a striker pin in the bakelite igniter. The metal striker pin is picked up by mine detectors at only 1 1/2 inches, and prodding is ineffective. Therefore detection is extremely difficult if the mine is well laid.

Some of the mines encountered were found on the shoulders of roads which had been in use by allied troops for about 6 days. These roads had been clear of mines previously. One mine was found in a path on the shoulder of a road. Prints of heavy, hob-nail boots were noted near the mine and on a path leading from it. Another mine was found on the shoulder on the opposite side of the road. An empty cigarette package, of a popular American brand, had been placed on top of the firing mechanism. All mines were placed on a sharp curve in the road.

The mine (see accompanying sketches) is made by tying packages of plastic explosive around an ordinary 1/2-pound block of cast explosive of Italian manufacture. Ordinary twine is used for tying. The firing mechanism consists of a bakelite igniter containing a metal striker pin and with a detonator complete with flash cap attacked. The detonator is inserted in the cast explosive as a booster charge. Firing pressure of the mine is less than 75 pounds. The preliminary drawing from which the accompanying sketch was made is not sufficiently detailed to show how the firing pin is retained in the igniter.

To disarm, examine the mine for trip wires that may be attached to the cord and carefully remove the firing mechanism from the booster charge.

INFANTRY

14. GERMAN MOTORIZED INFANTRY DIVISION

(Panzer Grenadier Division)

German organizations have consistently shown a trend toward conversion of infantry divisions into motorized infantry divisions (Panzer Grenadier Divisions) which in turn have been converted into armored divisions (Panzer Divisions). The German motorized infantry division represents a definite step in the direction of the armored division as shown by its organization:

Strength:
Approximately 15,000 officers and enlisted men.
Organization:
Division headquarters
Armored reconnaissance battalion
Signal battalion
Panzer battalion, including 4 tank companies.
Two motorized infantry regiments.
Divisional artillery regiment
Antitank battalion
Engineer battalion
Divisional services

It is apparent that the German panzer grenadier division is extremely mobile and flexible.

Each weapon is employed to the fullest advantage while maintaining the maximum mobility. The motorized infantry is particularly strong in the attack because of its mobility, high fire power and armor protection. It is able to carry out independent tasks because of the high allotment of heavy weapons. Its main roles are: cooperation with tank units in quick mopping up and consolidation of terrain penetrated by the tanks, supporting the tank attack by overcoming nests of enemy resistance, removing obstacles, establishing bridgeheads, and protecting assembly and bivouac areas.

a. Training

(1) Without Motor Transport

Troops must be trained in endurance by systematic marches up to 25 miles (at night, through woods, in all weather and with equipment and ammunition) and in winter bivouac conditions. Six men from each company will be given a short course as radio operators for use at company headquarters.

(2) With Motor Transport

In every section 3 men will be thoroughly trained as drivers. Others will be trained as drivers if there is sufficient time and fuel allowance. All must be

[redacted]

competent to carry out motor transport maintenance. Drivers must be able to withdraw quickly from enemy fire and to find good fire positions. All types of firing from the vehicle at halt and on the move must be practiced, especially at targets of opportunity. The sections consist of 12 men with the following weapons:

3 LMGs -- one mounted.
2 Submachine guns.
7 Rifles

b. Approaching the Enemy

All weapons are to be ready to fire and men detailed for all around observation. When under rifle or machine gun fire move forward, when in an area under artillery and mortar fire make a detour if possible, otherwise continue at normal speed.

c. Fighting from the Armored Personnel Carrier *

The chief weapon of the section in fighting from the vehicle is the fixed machine gun. This will generally be fired when the vehicle is at halt. Halts for firing should not be longer than 15 to 25 seconds.

d. Fighting Dismounted

The fixed machine gun will be used to cover the section as it dismounts. The vehicle must be kept ready under cover. If the enemy offers strong resistance and when support from adjacent sections or heavy weapons is lacking, strong machine-gun fire is necessary to allow the rest of the section to move forward.

e. Patrols

The armored vehicle is useful for reconnaissance tasks with limited objectives, but in view of its insufficient radio equipment it is not suitable for long-range operations. A patrol is usually organized as follows: commander and 3 riflemen with 37-mm antitank gun in one vehicle and a section, including riflemen trained in gas detection and engineering, in another vehicle, together with 1 or 2 messengers.

Unnecessary fighting is to be avoided but a weaker force may be destroyed if this does not interfere with the original mission. If the enemy is in force, contact should be quickly broken. Smoke can also be used in these circumstances.

When taking up a position for observation two alternative positions must be chosen; one for the night and another for occupying before daylight. The vehicles must be off the road, under cover, but kept in readiness for battle. Reports should be made on all mined areas marked by the enemy. If the patrol does not have time to remove mines, the area must be marked and a detour made. Ground reconnaissance is always to be linked with the main reconnaissance. A detour

*The number of armored vehicles per unit is unknown. Where fighting from vehicles is mentioned above, it is presumed that it is from armored personnel carriers.

[redacted]

should be made of inhabited places unless the execution of the order makes driving through them absolutely necessary.

If the enemy is presumed to be present, a part of the patrol must go forward on foot under cover of the weapons on the vehicles. When making a reconnaissance of a river sector an approach with the vehicle right up to the river must not be made. Speed should be reduced and the vehicle driven off the road to avoid causing dust clouds and noise. When used as a point, messengers will be allotted.

f. Assault Troops

When used as assault troops and also in wood fighting the weapons carried should consist mostly of submachine guns, plenty of hand grenades, smoke grenades and demolition charges. Often only one machine gun will be taken but plenty of ammunition distributed among several riflemen. The latter can, instead of taking their rifles, be given submachine guns.

g. Division Organization

In the German Panzer Grenadier Division, each of the 2 panzer grenadier regiments is composed of the following units:

Regimental headquarters
Headquarters company
3 panzer grenadier battalions
13th company (infantry howitzer)
14th company (antitank)
Light infantry column

The panzer grenadier battalion, according to previous information, consists of:

Battalion headquarters, with communication section
3 rifle companies
1 machine gun company and the battalion trains.
The rifle company breaks down into:
Company headquarters
3 platoons
Antitank rifle section
Each platoon breaks down into:
Platoon headquarters
4 squads
1 light mortar section, each squad having:
1 light machine gun
The machine gun company breaks down into:
Headquarters
3 machine gun platoons
1 medium platoon

[redacted]

Each machine gun platoon has 2 sections of 2 heavy machine guns each, the medium mortar platoon having 3 sections of two 81-mm mortars each.

New reports indicate a trend within the organization of the panzer grenadier battalion of the panzer grenadier division toward that of the panzer grenadier battalion of the panzer division. According to these reports each panzer grenadier battalion would break down into 3 to 4 companies, each of 3 light platoons and 1 heavy platoon. Each light platoon is reported to consist of 3 squads, each armed with 2 light machine guns; in the heavy platoon, 2 heavy machine gun sections, each with 2 heavy machine guns and 1 heavy mortar section of two 81-mm mortars.

h. March

Over level country, average speed of 15 miles per hour can be maintained. Maximum speed under favorable conditions is 18 to 22 miles per hour. An average of 94 to 125 miles can be covered in a day if there is no contact with the enemy.

Intervals between the point squad and support platoon are generally one minute and between the support platoon and the company, 2 minutes. If the company has under command a heavy antitank weapon it should be placed forward. Other heavy weapons are normally placed in the rear. The company commander with commanders of allotted heavy weapons and artillery observers normally travel together behind the support platoon. Each platoon will detail observers to watch the flanks.

When contact is made the command must decide quickly whether the enemy can be attacked on the move or whether the company has to take cover and prepare for the attack. Obstacles covered by antitank weapons will necessitate an attack dismounted, if a detour cannot be made to take the enemy in the flank or rear.

i. Halts

Twenty-minute halts every 2 hours should be made if the situation allows. These halts must be utilized for making small repairs and refuelling vehicles. Rests are normally taken every 4 to 5 hours. If a meal is taken during this period the full time allowed should be 2 to 3 hours. All available sheds, barns, farm buildings, etc., must be used. Vehicles must be backed in so that they can resume the march quickly without having to turn around.

MEDICAL

15. GERMAN SWAMP STRETCHER

To move sick and wounded through the almost impassable marshlands of the Kuban front, the Germans adapted the Finnish plywood "akja" sled (see

[redacted]

GERMAN SWAMP STRETCHER

Tactical and Technical Trends, No. 19, p. 28) as shown in the accompanying illustration. In a terrain where to attempt to carry wounded in an ordinary stretcher would have been exhausting to the point of impracticability, this sled provided an easily-handled and reasonably-comfortable vehicle. At a later stage, the patients were moved in shoal-draft, outboard-motor skiffs.

ORDNANCE

16. JAPANESE HEIGHT FINDER

The Japanese height finder is a self-contained stereoscopic optical instrument used to measure both range and height on the principles of triangulation. It is dependent upon magnification and base length, the two basic conditions which serve to increase the stereoscopic sense of the observer. The greater the base length of the instrument and the greater the magnification, the greater amount of depth perception will be attained. This enables the observer to read with greater accuracy the distance to targets of extreme range or height.

a. General

The Japanese instrument has a base length of 7 feet 2 1/2 inches and can operate on only one range of magnification--20 power with a field of 2° 15'. Its total weight is about 500 pounds and it disassembles into three major units: the tripod, cradle and tube. These units are packed separately in steel containers for transportation. The Japanese instrument has only an outer tube and optical bar. In adjusting its measuring wedges, the Japanese height finder depends solely on external targets of known ranges or altitudes. However, it has an adjusting lathe of such construction and dimensions that when it is set about 50 yards from the instrument it can be used as an infinity target. At night this lathe is rendered useless so that it is necessary to adjust the height finder on a visible astronomical body such as the moon or a star. These bodies being at an infinite distance the measuring wedges are adjusted at their infinity setting.

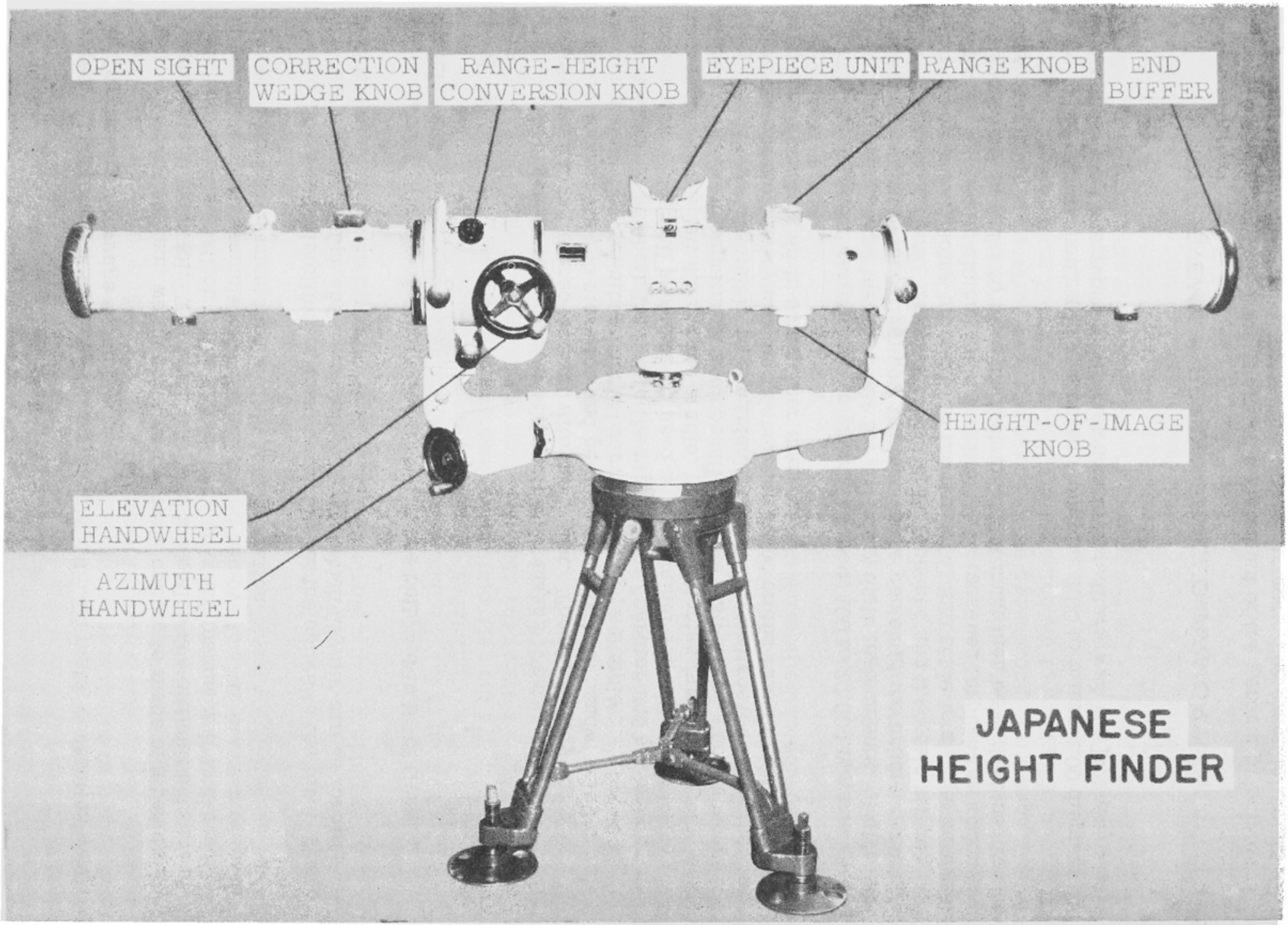
b. The Wedges

There are two rotating and one sliding measuring-wedges, and a mechanism for concerting the wedge to read either range or height during operation. The correction wedge assembly is machined out of brass. It employs a system of stop rings to control complete movement of the glass wedge.

c. The Optics

The main optics of the Japanese height finder are extremely small in diameter so that the field of view is greatly decreased and the light transmission reduced. However, the instrument contains all the optics usually found in stereoscopic instruments, namely: 2 end windows, 2 end reflecting units, 2 objective lenses, 2 erecting systems, 2 ocular prisms, 2 reticles, 2 eye lenses, 2 field

[redacted]


OPEN SIGHT
CORRECTION WEDGE KNOB
RANGE-HEIGHT CONVERSION KNOB
EYEPIECE UNIT
RANGE KNOB
END BUFFER
HEIGHT-OF-IMAGE KNOB
ELEVATION HANDWHEEL
AZIMUTH HANDWHEEL
JAPANESE HEIGHT FINDER

[redacted]

lenses, 2 rhomboid prisms, ray filters, height if image plate, correction wedge and the measuring wedge assembly.

The optical bar, which contains the main optics, is made of a beautifully finished stainless steel. The adjustments of the optics are difficult because of their undesirable position in the optical bar. In many instances it is necessary to completely disassemble the instrument and remove the bar in order to make the necessary adjustments for satisfactory operation.

There is a simplified method of drying out the optics in the tube. There are two plugs on either end of the tube through which dry air can be forced periodically but not during actual operation.

The optics are of excellent quality but are believed to be of German manufacture.

d. Operation

The Japanese method of tracking a target makes it extremely difficult for the observer to get stereo-contact with the target. They have only one man tracking in azimuth and elevation and he must operate both handwheels for azimuth and elevation simultaneously observing through a simple metal open sight. The handwheels are both located to the right of the operator and are only a few inches apart. A small wooden box, used as a container for several batteries, is mounted on the left side of the cradle. These batteries furnish the only means of illumination for adjustment and operation of the instrument. The Japanese height finder has absolutely no electrical connections whatsoever with other instruments in the battery and the information found on the range drum is either telephoned or signaled in some other manner.

The Japanese range drum is graduated from 400 to 20,000 meters. However, the Japanese use the mil scale for orienting their instruments. A circular mil scale is located directly below the tube in the center of the cradle, secured with two small screws. These screws can be loosened and the scale slipped until the desired reading is found. In the center of this scale is a large handwheel connected to the slip clutch plates which must be loosened through the action of the handwheel in order to slow the instrument; it must then be retightened to continue operation.

The diopter setting is graduated from plus 2.00 to minus 4.00 diopters to compensate for the myopic condition which is hereditary with the Japanese soldier.

17. ENEMY USE OF SPACED ARMOR

A recent British study provides a statement of the general principles governing the attack of, and defense by, spaced armor. The essential points bearing on the use of spaced armor by the enemy, that follow, are taken from

[redacted]

the British report.

* * *

Two separated homogeneous plates attacked by A.P. shot, or 2 separate plates in loose contact, are less effective in defense than a single plate of the same total thickness. This is because there is no shearing resistance over the internal free surfaces.

A front cemented (face-hardened) plate separated from a rear homogeneous plate attacked by A.P.C. (armor-piercing capped) shot will, for the same reason, offer less resistance than a single cemented plate of the same total thickness.

A front homogeneous plate separated from a rear cemented plate offers increased resistance to A.P.C. shot as the front homogeneous plate destroys the cap of A.P.C. shot and so diminishes the effectiveness of the projectile against the cemented surface of the rear plate. The important point in this construction is that by the use of spaced plates the cemented face can be made to be an interior surface of the system, and so afford protection against an A.P.C. shot de-capped by the front plate.

For the same reason a rear cemented plate offers increased protection against a tungsten carbide cored shot, unless the core is very well protected by a cap and some form of cushion.

A rear cemented plate will also offer greatly increased protection against an A.P. shot because the nose of the A.P. shot will be partly damaged by the front homogeneous plate, and so will have a still further diminished power against the cemented surface of the internal plate.

From the point of view of attack, the effectiveness of capped (A.P.C.) and uncapped (A.P.) projectiles varies in different calibers owing to a differing balance of advantages and disadvantages. Though a cap tends to preserve the point of the ogive (the curved and pointed head of the projectile) during perforation of the front plate, the cap itself is destroyed by the same action, and thus kinetic energy is wasted. In one caliber the reduction of energy due to loss of the cap before reaching the interior plate may result in failure to perforate, whereas in a larger caliber the loss may have a less pronounced effect on the ultimate performance, resulting in perforation of 2 plates of the same quality and equally well matched.

It is true that an A.P. or A.P.C. shot tends to turn towards the normal on perforating a plate, but in the case of spaced armor any advantage which might be gained thereby is likely to be neutralized by the acquisition of a transverse angular velocity which may result in increased yaw. For this effect to be appreciable, plates should be separated by a distance of at least one caliber.

[redacted]

18. TRACK-WHEEL VEHICLES

Experimentation by Austrian automotive engineers to produce for the German army a dual-purpose vehicle which will be capable of quick conversion from wheel to caterpillar traction is reported in an article printed recently in the German technical publication "Wehrtechnische Monatshefte". A translation of the article follows:

*　　　*　　　*

A suitably-built caterpillar vehicle is fully capable of cross-country travel, but has only a limited cruising radius. The caterpillar track cannot be used for travel on highways at great speed without excessive wear and tear.

Vehicles on wheels, on the contrary, develop great speed and have a great cruising radius, but are poorly suited for cross-country travel, even when equipped with all-wheel drive.

It was quite natural, therefore, to think of creating a vehicle which would be adequate for both cross-country and road travel, that is, caterpillar motion with motion on wheels.

Practical development of this idea has for more than two decades been the subject of research and experimentation. To some extent the creation of tanks is closely associated with that development. Worthy of mention in this connection is particularly the Christie type of construction, such as Russia is using for light battle tanks. Unquestionably, however, this principle involves certain technical and tactical disadvantages, due to the fact that the vehicle's crew requires half-an-hour for the work of removing the caterpillar chains, and must leave the vehicle to do this. One of the advantages, however, is that the width of the vehicle remains unchanged. In the Kolo-Housenka tank of the Vollmer type, developed by Skoda, 4 wheels have to be attached from the side, and the method of driving the vehicle into position on blocks involves much additional difficulty. There was an advantage, however, in the simplicity of construction of that type of vehicle, so that these Skoda vehicles were regarded favorably for a considerable period of time.

Of real importance were the wheel-caterpillar vehicles of Landsverk, Sweden. The wheel running gear is built solidly into the car, and can be lowered on the outside by means of a spindle joint. Change from caterpillar to wheel operation, and vice-versa, can be effected while the vehicle is in motion. Both, the French and the English have attempted similar types of construction, but due to its practical adaptability for military purposes the Swedish type of construction was considered superior.

[redacted]

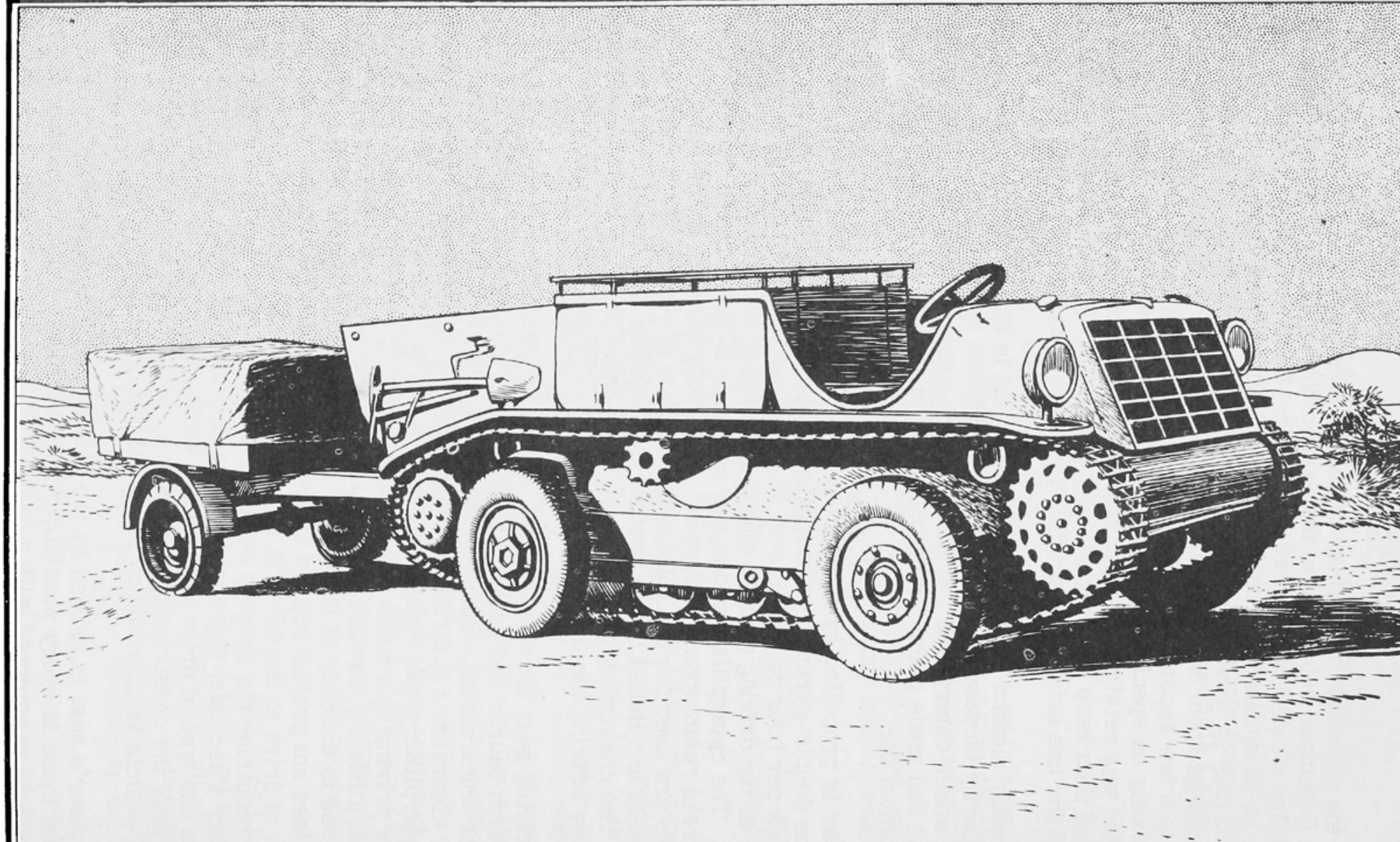
Under the stimulus of experimentation in other countries, the former Austrian High Command submitted to the Saurer Works (Vienna) a list of requirements for building a caterpillar-tread wheel car. While traveling on wheels, the vehicle was to be adequate for cross-country travel, and the caterpillar treads were to be used only in traversing particularly difficult terrain. This was taken to imply that change from one type of drive to the other could be done from the driver's seat in a few seconds of time. Consequently, since the caterpillar treads are to be used only on special occasions, and since, therefore, the wear and tear to be anticipated was relatively slight, it would be possible to avoid large structural design and thus keep the weight of the car within close limits. The vehicle must be suited for use not only in draft but also for carriage of heavy loads.

After many months of trial on level terrain, in mountains of moderate and great height, partly on snowy ground, with and without attached loads, Saurer developed his wheel-caterpillar car RR (Räderraupenwagen) Type 7. The Austrian High Command had made plans for developing this vehicle as carrier, prime mover, and combat car.

This car is propelled by a Diesel motor located in front. The motor is operated on the double-gyration principle, and the speed with trailer is approximately 45 miles per hour on wheels and 12 miles per hour on caterpillar treads. Transmission to the driving gear is effected by means of a dry-operated, single-disk coupling. The caterpillar treads are moved by 2-drive wheels located in front. Each tread rests upon 6 uncovered, stamped rollers of sheet-metal. Helical springs are used for the rollers. The joints of the tread are made of alloyed cast steel and linked to one another by specially hardened bolts of chromium nickel steel. The chain cleans itself while in motion. Steering is effected through a differential by braking the movement of the inside tread when taking a curve.

The driving gear for use on wheels embodies a number of structural innovations which Saurer had previously found satisfactory upon testing in the construction of truck series. Since it was necessary for wheel driving to provide the necessary clearance for turning of the wheels, the front wheels placed laterally outside the caterpillar tread entailed a corresponding extra width of vehicle; and for caterpillar driving this width has to be reduced sufficiently to enable the car to pass without difficulty through narrow sunken roads. As the wheels are drawn up, they fit close to the body of the car; in fact, the lower part of the wheels in this position does not project beyond the outer edge of the caterpillar tread. Change from one type of drive to the other is effected by an auxiliary motor through a worm gear, without requiring the crew to leave the vehicle. Since the time required for changing is only 4 seconds, there was no attempt to insist on an arrangement for changing from one type of drive to the other while the vehicle is in motion. This helped to simplify the construction and reduce costs. Only the rear axle is motorized when the vehicle is operated by means of the wheel drive.

The driver's seat is located by the side of the motor, at the front of the vehicle, so that there is every possibility of modifying the superstructure further back. This vehicle is equipped with a cable winch.



GERMAN DUAL TRACK AND WHEEL CAR

[redacted]

Further details follow:

Motor	4 cylinder Diesel, type CRDV
Continuous output (with brakes)	70 HP at 2,000 rpm
Gear ratio	4.91:1, 3.03:1, 1.72:1, 1:1, 0.75:1, reverse 4.58:1
Rear axle reduction	5.9:1
Tank capacity	Approx 18 gals
Fuel consumption (wheels)	Approx 5 gals per 100 miles
Fuel consumption (treads)	Approx 2 quarts per mile
Dead weight	Approx 8,800 pounds
Useful load	Approx 4,400 pounds
Total length	14 feet, 3 in
Height on treads	5 feet, 3 in
Width on wheel drive	7 feet, 2 in

Circumstances did not permit the planned far-reaching adoption of this vehicle in the Austrian Army in 1938. But development of the type is being continued.

Comment: Vehicles of this Austrian type were reported by observers as in use by the German Army in the Middle-East theater.

SIGNAL CORPS

19. NEW GERMAN EMERGENCY TRANSMITTER

The German Emergency Transmitter NS-4 is a 2-tube, self-contained, battery-operated, air sea rescue transmitter, apparently replacing the NS-2 prototype of the Gibson girl transmitter. The apparatus is colored bright yellow, is buoyant and water-tight, and a length of cord and a hook enable the instrument to be secured to a person or small boat.

The estimated life of the battery on intermittent use is about 4 hours. The instrument is preset in the frequency band of 53.5 to 61.0 megacycles and radiates a modified continuous wave note of approximately 400 c.p.s.*

The equipment is well-designed, its special features being its compactness and light weight. It has a limited life however, and gives evidence that it was designed to replace the NS-2 which uses far more critical materials.

a. Construction

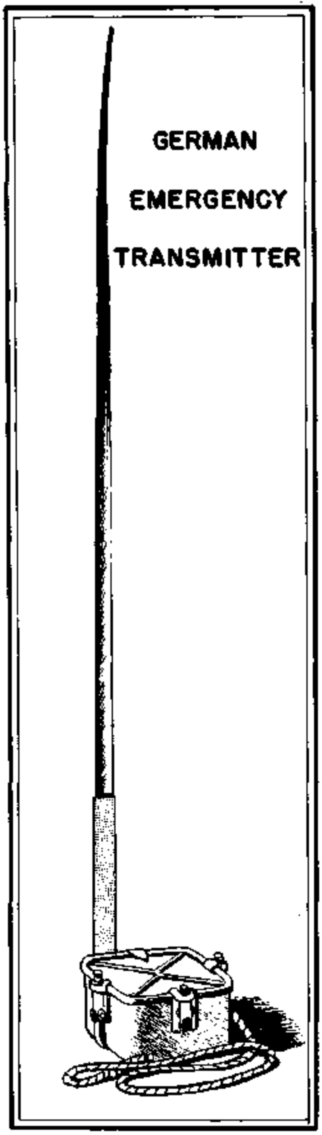
The equipment is housed in an aluminum box measuring 6 1/4 x 6 1/4 x 3" and weighs 3.5 pounds. The base and lid of the box are stiffened by 2 ribs made

*Cycles per second

[redacted]

diagonally in the material and the lid is secured by 4 screw fittings which are rivetted on the outside of the box. A rubber gasket ensures a watertight joint.

The transmitter is secured in the box by means of 4 captive screws, one of which is used as a connector to the aerial. Two of the screws are located beneath the batteries which must be removed before the screws can be loosened.



The chassis is not of the usual die cast construction but is of sheet aluminum spot-welded together. No tube holders are used, the connection being made by soldering directly to the pins of the valves. The coils and condensers are of ceramic material with the exception of paper smoothing condensers in the vibrator pack.

b. Antenna

The antenna is of particular interest. It is a 3 ft 5 in strip of copper-plated steel tape similar to that used in pocket rules, and is wound around the box when not in use.

The antenna system might be used on vehicles or pack sets but would not be suitable for aircraft use. The base of the antenna is 1 inch tapering to 3/16 inch and has been sheathed in rubber for the last 10 inches to avoid shorting due to heavy rain or spray.

The antenna may be swivelled in one plane and is wrapped round the instrument and held in position by 2 clips when not in use.

Two press switches fitted with rubber covers are located under one of the antenna retaining clips; when the antenna is unwound the transmitter is automatically switched on. In the sample examined one press stud marked K was not used, the contacts of the switch not being fitted. This is probably used to key the transmitter for sending Morse and conserve the battery life.

c. Vibrator Unit

The vibrator is of the non-synchronous variety and is particularly interesting as the frequency is approximately 810 c.p.s. The armature is of unusual design being a light, flat strip at right angles to the reed. The magnetic circuit is smaller than in the conventional vibrator although the driving coil is a good deal larger. A separate driving contact is used and the whole contact assembly is considerably smaller than usual.

No rectifier is used, the raw A.C. being applied to the transmitter so that the carrier will be modulated at the frequency of the vibrator and its harmonics.

d. Batteries

The 2-volt lead acid batteries used for power supplies are 1 1/4 x 1/2 x 1 3/4" and weigh approximately 1 1/2 ounces each. Eleven are used in all, 3 in parallel for the 2-volt filament supply and 8 in series parallel for the 8 volt vibrator supplies. These make up 1 pound of the 3 1/2 pounds which is the total weight of the equipment. These batteries were originally developed for the meteorological balloon transmitters.

A discharge test was carried out and the 2 volts fell to 1.7 volts in 2 hours 40 minutes and the 8 volt to 6 volts in the same time. A translated enemy document indicated that the batteries last 4 hours if switched on for 3 minutes and off for 1 minute.

GENERAL

20. SOME ASPECTS OF SECURITY

In all branches of the intelligence service, the source of information determines its value. It is the origin that must be tested first, and not the information. Some interesting points about this general subject of security and certain of its related aspects are contained in the following article presenting ideas expressed by the noted military critic, Liddell Hart, excerpts of which were published in Military Intelligence Pamphlet, Vol. IV, No. 8, Union of South Africa.

* * *

The fear of treachery, among the people of a country attacked, is one of the best weapons that an invader could devise, with the aim of creating confusion and distraction among the armed forces and the people behind them. The term, "Fifth Column" is recent, but the underlying idea is one of the oldest in the history of warfare. Yet there are few important examples in history of successful betrayals in wars against a foreign foe as distinct from civil wars.

On the other hand, there is much evidence of the damage caused by the fear of treachery. In the Franco-German War of 1870-1, the cry of "Nous sommes trahis"* played havoc with the defense of France. The same fear, intensified by being embodied in the new term "Fifth Column", played an even larger part in the collapse of France in 1940. The general state of suspicion went far towards paralysing all resistance to the invader. It was fear of the Fifth Column, rather than the activities of Fifth Columnists that did the damage. This is a danger we have to guard against in our security measures. We must keep our balance, lest in over-zeal for security, which is the negative side of war, we hamper our positive efforts. By an exaggerated use of the term "Fifth Column," we not only play

*We are betrayed

[redacted]

the enemy's game but put a master-card in his hand, the joker. Do not be too quick to suspect anyone, but develop an attitude of critical doubt towards everyone. The line which a good intelligence officer should take is to maintain an attitude of discreet observation, while taking care to avoid generating an atmosphere of suspicion.

a. Working Rules for Intelligence Officers

The attention of the ordinary public tends to focus on anyone-

(1) who has a foreign accent;
(2) who is eccentric in behavior;
(3) who voices unpopular opinions.

It is a good working rule for intelligence officers to start by asking whether a particular suspect comes in one of these categories, then to ask whether suspicion was first aroused by the man himself, or by something particular he has done. Cases where no suspicion had oeen aroused prior to some particular incident are far more likely to be worth serious investigation. Even then a cool-headed judgment based on thorough military knowledge for sifting such cases is required, in order to gauge whether an incident reported could, in its setting, have a real military bearing.

Do not always use the same methods in attempting to apprehend the enemy agent. The more uniform the methods, the easier it will be for the enemy agent to avoid them by refraining from the obvious things that excite suspicion. There is just as much need to practise surprise in security work as there is on the battlefield.

The most serious leakages of information come from the top. Lower down in the scale of rank and position there is indeed often a tendency to run to the other extreme, and to withhold information that ought to be known by those concerned for the efficient performance of their job.

Such over-caution usually arises from an inability to discriminate between what does and does not matter--a lack of discrimination due to lack of knowledge. The real art of security is to be so open in discussing most things that the very existence of the few things that really matter is not even suspected.

In dealing with cases of careless talk, it is better to rely on admonition than on punishment. Most people who err in this way would be horrified if they thought that they were doing anything detrimental to the national war effort. A traitor sells his information privately, he does not broadcast it.

All security issues tend to be a compromise between the conflicting claims of mobility and security. It is a good general rule that when in doubt mobility should be given preference, as the offensive and time-winning factor. The Germans have profited greatly by sacrificing security on occasions, in order to gain time and ensure that personnel act in the light of the fullest possible knowledge. The

German principle is that it does not matter if the enemy learns where you are going so long as you get there first.

b. Gathering Information

The positive side of intelligence work, namely the process of gathering information, is more of an art, and less of a technique, than the negative or security side.

Important as is the capacity to collect information, still more important is the ability to sift and evaluate it, to draw the right deductions from it. An intelligence officer who cannot see the wood for the trees is of limited help to his commander.

The qualities for the collection and interpretation of information are listed hereunder:-

(1) Knowledge--The importance of military knowledge, as the basis of intelligence, and thus in turn of generalship, has been emphasized by every great commander before and since Napoleon. The more military knowledge you have, the better your chances of appreciating the significance of something that, to an untrained mind, would seem trivial or irrelevant.

The need for being acquainted with the enemy's methods, especially his tactical methods, should be emphasized.

This is a side of intelligence where we [British] compare badly with some other armies, notably the German. Lawrence of Arabia once said: "The enemy I knew almost like my own side. I risked myself among them, many times, to learn."

(2) Sense of Relativity--The power of relating one thing to another, and the bits to the whole; a capacity for seeing the wood at the same time as the trees.

(3) Inquisitive Sense--Inquisitiveness or curiosity springs from the vital instinct to discover the truth about things. By this is meant "intellectual curiosity", which is the source of the scientific spirit.

(4) Accuracy--The greatest possible care must always be taken to ensure that your data is correct, that it is precisely worded and objectively presented.

Moreover the good intelligence officer must be able to gauge the reliability of the evidence which he assembles. While careful to discredit nothing without examination, he should doubt everything until he has verified it. This is particularly important as a guard against being deceived by the enemy--and remember that deception is the main instrument of strategy.

(5) Receptiveness--Having the quality of receiving or taking in what is actually communicated, as distinct from what you would wish to hear communicated.

[redacted]

This quality is equally important on the part of the commander.

Advice tendered by Intelligence should be based strictly on scientific inquiry. Any encouragement given to wishful thinking on the part of the commander, out of mistaken loyalty, is the greatest disservice which can be rendered to a commander.

(6) Creative Imagination-- (the power of projecting your conceptions of what is going on behind the enemy's lines and in the enemy's mind.) Closely linked with this is the power to visualize a map, or rather the ground represented by that map. Sir John Monash (by general recognition perhaps the ablest commander we produced in the last war) had the power of creative imagination strongly developed, so that he could get a clear picture of the battle-front although remaining at rear headquarters.

c. Organization

Good information cannot be expected unless there are adequate personnel to obtain it, and of high enough rank in their particular sphere to enable them to make their voices heard. It is natural that commanders should feel that the number of officers and men allotted to intelligence duties is a subtraction from fighting strength. But experience shows that the subtraction is more than compensated by the value of having better and quicker information on which to act.

In periods of active fighting, you cannot expect to get information back in time to be acted upon, from commanders actually engaged in the fighting. They and their staffs will be occupied in thinking about what the enemy is doing. The principle of "liaison forward" should be adopted.

Every superior HQ should have its own qualified observers forward with the subordinate HQ to send back continuous and immediate reports of the development in the situation, instead of relying on reports received from the subordinate HQ. This system of "liaison forward", highly developed by the Germans, revives Napoleon's expert aide-de-camp system.

Every system of intelligence has the two problems to solve, that of obtaining information, and obtaining it in time. An intelligence staff must go out and seek information; but it must also locate itself where information is likely to be received. Much can be learned by applying the system adopted by the spider in spinning his web for catching flies.

SECTION II

GERMAN FIELD DEFENSES

[redacted]

GERMAN FIELD DEFENSES

As in the case of attack, the final goal of defense is victory -- the destruction of the enemy. One of Germany's great military writers states the following: "A fundamental principle is never to remain completely passive . . . the act of entrenchment shall serve the defender not to defend himself more securely but to attack the enemy more successfully."

Tactical and Technical Trends has already included previous references to German defensive methods in various theaters of war. However, it is thought that the following summary of Russian experience, particularly concerning enemy troop dispositions and the use of appropriate fire power, which appeared in an allied publication, may provide interesting material at this time.

*　　　　*　　　　*

a. General

The Germans base their defensive systems on inhabited localities, on commanding heights and on the exploitation to the uttermost of tactically advantageous types of terrain. The German principle of basing defenses on inhabited localities is particularly strongly marked during the winter.

The Germans' defensive system is principally formed of separate zones of resistance laid out for all-around defense with mutually supporting fire. The ground between the defense areas is covered by fire, often protected by obstacles and invariably patrolled.

However, it has been noted recently that at some points on the Eastern front the Germans are endeavoring to create a continuous defensive belt by filling in the gaps between defense areas with several lines of communication trenches, extended along the whole length of the front.

When organizing a defensive system the Germans attach great importance to the nature of the ground. Weapons are located after consideration of the possibilities of camouflage and enfilading fire.

Tactically speaking, the German defense zone generally consists of two defensive areas with a total depth of from 5 to 10 miles. The main elements of the defense are concentrated in the first defense zone, which the Germans term the "main defensive belt". On an average this zone is from 4,000 to 6,000 yards deep, and includes the artillery positions. The second defense zone gives added depth but, as a rule, is thinly held. Under certain conditions it is occupied by reserves who prepare it in advance should it seem that the defense will be forced to withdraw.

According to the Germans, the defense will be withdrawn from the first to the second zone when the resistance of the troops in the "main defensive belt" is

[redacted]

broken and when the bringing up of reserves to the "main defensive belt" is likely to lead to disproportionately heavy losses.

Individual defense areas and fortified positions are set up in the area between the two defense zones; their purpose is to safeguard the rear of divisions and headquarters against the attacks of Russian guerillas and of the Red Army units which have penetrated to the rear. In addition, the two defense zones are connected by switch lines.

Experience has shown that whenever the Germans decide to put up a stiff resistance on a given sector, they put all their forces, including army reserves, in the "main defensive belt" and that they even transfer units from other sectors for the purpose.

German strategic defense includes defensive areas in depth; these are generally prepared in advance by forced labor. The defenses are finally completed by the troops themselves, as soon as it seems imperative to withdraw to the new areas.

In addition antiaircraft artillery in separate zones of resistance for the protection of important military objectives - bridges, railway junctions, communication zones - is situated within the depth of the German strategic defense. The frequent attacks by Russian guerillas on important military objectives in the rear of the enemy have forced the Germans to provide strong protective forces and often to put up special field fortifications for the protection of these objectives.

b. "Main Defensive Belt"

The German main zone of defense is generally selected on the basis of the terrain advantages and invariably includes inhabited localities. The immediate front of the main zone of defense must be easy to cover by observation and crossfire.

The main zone of defense consists of the company defense areas incorporated into the battalion defense areas. The ground between these defense areas is covered by a system of enfilading cross-fire from automatic weapons and, if time permits, by artificial obstacles. In addition, this ground is kept under the fire of artillery and mortars, located in the defense zone.

The foundation of the "main defensive belt" is the battalion defense area. The battalion defense area can fight independently and is prepared for prolonged, all-around defense.

A company defense area includes two or three platoon defense areas, and in addition to automatic infantry weapons, antitank guns and mortars.

The German army considers the principal weapons of the defense to be LMGs, HMGs, mortars and antitank guns. Artillery fire is also used extensively.

[redacted]

The Germans prefer the following ranges in defense:

Rifles and LMGs	400 yds or under;
HMGs	1,000 yds or under;
Mortars	1,000 to 3,000 yds.

As a general rule, firing points are located in buildings adapted for defense; sometimes timber and earth firing points are built. Machine guns are frequently found in trenches, covered over with camouflage. Obstacles, and mines if available, are located in accordance with the fire-plans of adjacent defense areas, and are invariably kept covered by fire from the defense areas.

Roads and approaches to defense areas are carefully mined. A system of barbed wire entanglements, up to four poles wide, [probably 30 to 40 feet] concertina wire, etc., is put up forward of the front line. A less developed system of wire entanglements (up to 20 feet) is put between defense areas. Within the system of defense areas, besides the antitank weapons, antitank minefields are laid on corridors of approach which tanks are likely to use; antitank ditches and other static antitank obstacles are less frequently employed.

It should be noted, however, that the German command realizes the value of antitank ditches. Referring to the instructions of the Führer, an order dated 8 Sept. 1942 from the Inspector General of Engineers, points out the necessity of digging ditches one behind the other. It is indicated that these ditches should be dug sufficiently deep to make them effective in winter also.

The antitank defense of the German "main defensive belt" is based on the fire of:

(1) supporting artillery, intended to block the approach of attacking tanks, opening at from 3,000 to 4,000 yards (this is principally armor-piercing shell);

(2) antitank guns in the defense areas, and brought forward to form "antitank islands";

(3) antitank rifles, large caliber machine guns and also machine guns and rifles using armor-piercing ammunition against vision slits.

Attacking tanks, which have penetrated deep into the defenses (according to German instructions, those which have penetrated the "main defensive belt") are counterattacked from ambushes by tank destroyer detachments.

The Germans believe every infantry company should include one tank destroyer detachment, consisting of a sergeant, 4 privates and 2 snipers. This detachment is equipped with five 3-kg explosive charges, 4 antitank mines, 6 smoke and incendiary grenades. The detachments operate in the company sectors, co-operate with the antitank guns and generally take up their positions forward of the latter.

[redacted]

The defenders try to prevent penetration of their front line by concentrated fire and counterattacks.

When laying out the defense, the Germans generally create "fire-pockets", the purpose of which is to give the impression of a weak defense in a certain sector, encourage the attacking units to penetrate into that sector and then, having cut off their lines of withdrawal to destroy them.

"Fire-pockets" are generally located between defense areas, in flat open country bordered by woods, heights or buildings.

German fire-plans are normally based on the principle of concentration of fire; cross-fire in enfilade from automatic weapons; concentrated fire of mortars (see Tactical and Technical Trends, No. 38, p. 47); fire of antitank weapons; artillery fire from deep within the position. The average weight of fire-power per thousand yards of front is up to 5 infantry and antitank guns and 1 to 2 divisional artillery pieces.

It may be concluded from an evaluation of a number of translated German documents that German defensive positions are laid out on the following principles:

(1) The object of the position is to attain maximum results with minimum expenditure of manpower and weapons;

(2) Each defense area and each position should have all-around defense. No standard model of layout should be followed; close attention should be given to choice of ground for location of defensive positions;

(3) The guiding principle in the location of defense areas should be mutual support by infantry support weapons;

(4) The fire-power of defense areas should be reinforced by the laying of antipersonnel and antitank mines;

(5) All positions built should at least protect those inside against shell and mine splinters; whenever possible they should be capable of supporting the weight of tanks; shelters and command posts should be laid out for all-around defense; observation posts should be set up on ground covered by fire from the various positions; the separate positions should be welded into fire-units of at least a reinforced battalion in strength;

(6) Company defense areas should be combined into battalion defense areas. The distance between company defense areas depends on the ground and the situation;

(7) In the initial stages simplified constructions should be built; these can be strengthened later as time and resources permit;

[redacted]

(8) Existing buildings and local materials should be used as much as possible in setting up defensive positions; special consideration should be given to the use of cellars in houses and barns as shelters;

(9) Concealed positions (on reverse slopes behind buildings) should be selected for mortars which should be dug in; the positions should be changed frequently; roving guns and mortars should be employed;

(10) Special attention should be given to the selection of artillery positions, and to the protection of gun detachments and ammunition;

(11) Camouflage screens should be provided to enable the troops to occupy their positions quickly when alerted.

c. Field Engineering

The German engineers make extensive use of existing houses and industrial buildings, road embankments and fences. For heavy and light machine guns, automatic weapons, and artillery, special positions are built or existing ones adapted, where available. The Germans build dugouts for sections (seldom for platoons) on reverse slopes; some of the dugouts are given a field of fire; entrances are constructed on the side facing the enemy so as to get the infantry into action quickly. The Germans favor the construction of a very dense network of communication trenches, if time is available and ground suitable. A frequent German device to reinforce the defense is to dig in tanks, thus turning them into virtual pillboxes.

Many German field fortifications are built of timber and earth and in the majority of cases, are of a light type. Heavy works are very seldom encountered. They use such types of obstacles as wire barricades, wire entanglements stretched between trees, houses and fences, knife-rests, concertina wire, trip-wires.

They also use barricades in woods and on roads. In the winter they may resort to icing slopes. As a rule they mine their wire entanglements and barricades with trip-mines, booby traps, antipersonnel mines, and less frequently with antitank mines. In addition the Germans lay antipersonnel mines to protect their antitank minefields; minefields containing only antipersonnel mines have also been noted.

As antitank obstacles the Germans make wide use of various odd antitank mines and explosive devices, locating minefields at points threatened by tank attack. It should be noted that the Germans lay minefields not only in defense but also in attack for the rapid consolidation of an occupied area.

The scale of German mining operations may be judged from the fact that on the front of one army up to 15,000 mines and explosive devices were cleared in the course of three months.

[redacted]

An order issued to one German infantry division defense sector, stated that not less than three mines should be laid per yard of front.

All obstacles both infantry and antitank are covered by fire. Minefields are generally laid 200 to 500 yards from the forward edge of the forward defense line. There seems to be no systematic method of laying mines within the minefields.

The Germans, as is well-known, make extensive use of booby traps, setting them up in dugouts, houses, abandoned equipment of all kinds and even mine the corpses of their own men.

As has been pointed out above, the local population is pressed into service in the construction of their [German] defenses; their engineers are employed as fighting soldiers in cooperation with infantry and at critical moments even instead of infantry.

Special attention should be paid to the way in which the Germans adapt inhabited localities for defense (see Tactical and Technical Trends, No. 37, p. 36). As a rule the forward edge of the defenses does not run along the outskirts of the inhabited locality but is pushed forward about 150 to 200 yards. Projecting salients in inhabited localities are used for enfilading fire.

In addition to putting up the usual field works the enemy turns all the houses, barns and other buildings he needs into firing-points; all remaining buildings blocking the field of fire are burnt down.

The most common method of adapting houses for defense is to deepen the basement for use as a dugout, cut embrasures in the basement and reinforce the roof by means of logs and earth. In houses, especially of stone, the embrasures are generally cut in the walls; windows and doors are also made into embrasures. Barns and dwelling houses are likewise adapted for gun positions. For this the Germans generally pull down one wall and then place the gun inside. Attics are frequently used for machine guns and automatic weapons. Wire entanglements (knife-rests) are put up in the streets; sometimes these entanglements are intersected by deep ditches. Mortars are generally put up in open positions behind buildings in the outskirts in the rear of inhabited localities.

[redacted]

CORRECTIONS

No. 36, p. 12: The sketch of the artillery piece designated "A German 105-mm SP Howitzer," should have been described as a 15-cm s.FH 18 (Schwere Feldhaubitze) -- medium field howitzer on the PzKw4 chassis as indicated. This sketch was not intended as an illustration of Article 6 -- German 105-mm SP Assault Howitzer 42.

[redacted]

UNCLASSIFIED

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NUMBER 40

16 DECEMBER 1943

PREPARED FOR
ARMY GROUND, AIR
AND SERVICE FORCES

MILITARY INTELLIGENCE DIVISION

WAR DEPARTMENT · · · WASHINGTON, D. C.

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SECTION I

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ANTIAIRCRAFT

1. GERMAN PREDICTOR 40

The Kommandogerät or Kappagerät 40 is the standard German predictor used to control the fire of 88-mm, 105-mm and 128-mm antiaircraft guns.

It is used with the various guns by fitting it to the appropriate cams. In the operation of the Kommandogerät 40 allowances can be made for change of course as well as change of height. The height and range-finder used is a stereoscopic instrument.

a. Personnel

The number of men required to operate the Kommandogerät 40 is a commander and five men and their duties in action are:

Commander	Supervises work of the detachment
No. 1	Rangetaker
No. 2	Layer for line
No. 3	Layer for elevation
No. 4	Course-bearing plotter
No. 5	Feeds in corrections and operates switches.

It is the duty of Nos. 1, 2 and 3 to report all changes of height or course to No. 5. If a change of height is reported, No. 5 operates the switch marked "Höhenanderung" (target altering height); if a change of course is reported, No. 5 operates the switch marked "Zeil dreht" (target changing course).

b. Data

Traverse	360°
Elevation	0 to 90°
Slant range	1,308 to 19,620 yds
Ground range to present position	654 to 16,350 yds
Ground range to future position	654 to 16,350 yds
Height of target	0 to 39,360 ft
Horizontal speed of target	0 to 670 mph
Vertical speed of target	0 to 446 mph
Distance in azimuth travelled by target during time of flight of shell	0 to 6,540 yds
Lateral deflection	0 to 60°
Course bearing correction	0 to 90°
Height correction	0 to 9,840 ft
Displacement (horizontal)	0 to 1,640 ft
Displacement (vertical)	0 to 656 ft
Time of flight	0 to 30 sec
Drill time	0 to 10 sec

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c. Weights

Computing mechanism	2,090 lbs
Mounting	990 lbs
Trailer	1,890 lbs
Weight of equipment in transport	2.2 ton*
Weight of equipment in action	1.6 ton*

d. Disadvantages

The disadvantages of the predictor appear to be that a very high standard of training and careful handling of the instrument are required from the crew, especially Nos. 4 and 5, and it is reported that the complex construction of the instrument (24 motors and 34 differentials are included) renders it unsuitable for use in mobile warfare.

2. AREA BURST OF GERMAN AA SHELLS

The following data on the area of burst of some of the standard German antiaircraft shells have been obtained from a reliable source:

Caliber of Shell	Burst Along Line of Flight	Burst Laterally
20-mm	33 to 43 feet	10 to 23 feet
37-mm	33 to 66 feet	36 feet
88-mm	39 feet	98 feet

ANTITANK

3. VULNERABILITY OF TIGER TANKS

An article recently published in the Soviet Artillery Journal gave detailed instructions for the use of antitank weapons against the German Tiger tank. Vulnerability of various parts of the tank was cited in connection with directions for attack. The accompanying sketch shows vulnerable points and indicates weapons to be used against them. Material concerning the vulnerability of German tanks was published in Tactical and Technical Trends, No. 8, p. 46 and No. 11, p. 28. Detailed information about the Tiger tank was published in Tactical and Technical Trends, No. 34, p. 13.

A translation of the Soviet Artillery Journal article follows:

"The mobility of tanks depends upon the proper functioning of the suspension

---
*British long ton

[redacted]

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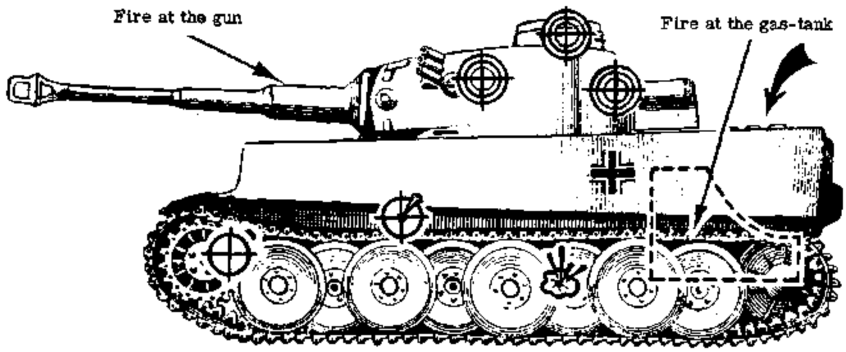
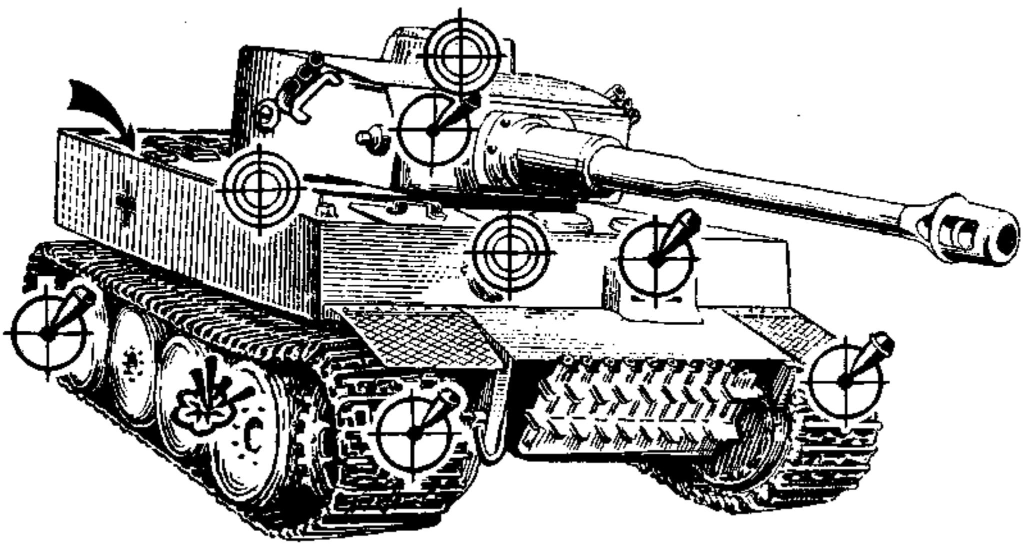
VULNERABILITY OF TIGER TANKS





Условные обозначения:

Стреляй из всех видов оружия.
Use all weapons

Стреляй из пушек всех калибров.
Use guns of all calibers

Забрасывай бутылками с горючей жидкостью.
Throw incendiary bottles

Бей противотанковой гранатой.
Use AT grenades

UNCLASSIFIED

parts -- sprocket (small driving wheel), idler (small wheel in the rear), wheels and tracks. All of these parts are vulnerable to shells of all calibers. A particularly vulnerable part is the sprocket.

"Fire armor-piercing shells and HE shells at the sprocket, the idler and the tracks. This will stop the tank. Fire at the wheels with HE shells. Also, when attacking a tank, use AT grenades and mines. If movable mines are used, attach three or four of them to a board and draw the board, by means of a cord or cable, into the path of an advancing tank.

"There are two armor plates on each side of the tank. The lower plate is partly covered by the wheels. This plate protects the engine and the gasoline tanks which are located in the rear of the hull, directly beyond and over the two rear wheels.

"Fire at the lower plates with armor-piercing shells from 76-, 57- and 45-mm guns. When the gasoline tanks are hit, the vehicle will be set on fire. Another method of starting a fire within the tank is to pierce the upper plates on the sides of the tank, thus reaching the ammunition compartments and causing an explosion.

"The rear armor plate protects the engine as well as giving additional protection to the gasoline tanks. Shells from AT guns, penetrating this armor, will disable the tank.

"The turret has two vision ports and two openings through which the tank's crew fire their weapons. The commander's small turret has five observation slits. There are two sighting devices on the roof of the front of the tank, one for the driver, the other for the gunner. Also, in the front of the tank there is a port with a sliding cover.

"The turret is a particularly important and vulnerable target. Attack it with HE and armor-piercing shells of all calibers. When it is damaged, use AT grenades and incendiary bottles (Molotov cocktails).

"There is a 10-mm slit all around the base of the turret. AT gun and heavy machine-gun fire, effectively directed at this slit, will prevent the turret from revolving and thus seriously impair the tank's field of fire. Furthermore, hits by HE shell at the base of the turret may wreck the roof of the hull and put the tank out of action.

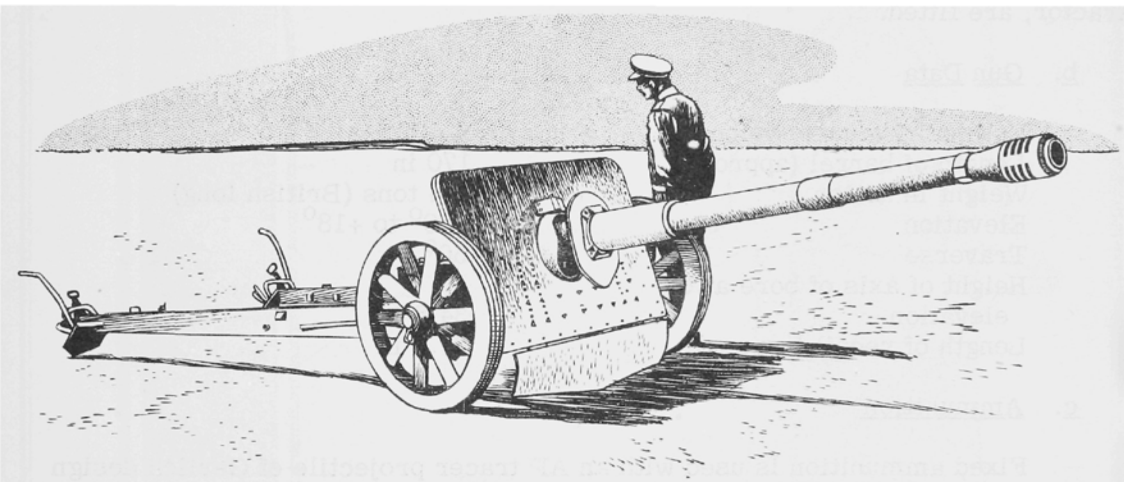
"The tank's air vents and ventilators are under the perforations in the roof of the hull, directly behind the turret. Another air vent is in the front part of the roof, between the two observation ports used by the radio operator and the driver. Use AT grenades and incendiary bottles against these vents.

"Explode antitank mines under the tank to smash the floor and put the tank out of action."

Accompanying sketch shows vulnerable points and indicates weapons to be used against them.

4. THE 75/55-MM AT GUN, PAK 41

An account of a new and powerful tapered-bore 75-mm AT gun made by the Rheinmetall factory, the 75/55-mm (2.95-in/2.17-in) Pak 41, has recently become available through Allied sources. The gun has a curious bore; the rear part is cylindrical and rifled; the central part, tapered and unrifled, and the muzzle section -- 27.6 inches -- cylindrical and unrifled. The weight of the powder charge fired is 95 per cent of the weight of the projectile. With an estimated velocity of approximately 4,000 f/s, and a penetration of 5.94 inches of homogeneous armor at 1,000 yards, the gun is most formidable.



THE 75/55-MM AT GUN

a. General

The 75-mm Pak 41, one of the latest German antitank guns to be brought into service, is the third* of the Gerlich or tapered-bore weapons introduced. In issue No. 7, p. 3 of Tactical and Technical Trends, reference is made to the use of this principle in the 42-mm Pak 41. A 75-mm tank gun, the 7.5-cm Kw.K 41, is also known to exist, and it is very probable that this weapon too is of the tapered-bore variety. The caliber of the 7.5-cm Pak 41 at the breech is 75 millimeters (2.95 in), while at the muzzle it is reduced to 55 millimeters (2.17 in). The reinforced breech is of the vertical wedge type, and is semiautomatic. There is a muzzle brake. The weapon is very long, low and sturdy in appearance. The carriage

*The other two are: the 2.8-cm (1.10 in) heavy antitank rifle and the 4.2-cm (1.65 in) light antitank gun.

which has a split trail, is unusual but extremely simple. The cradle is attached to the shield, which forms the basis of the carriage, by what is, in effect, a spherical universal joint. The cradle itself is cylindrical, and covers the whole of the rear half of the barrel. The gun is sighted up to 1,500 meters (1,635 yards), and the sight has four scales for use according to the actual muzzle velocity of the gun, which drops considerably owing to wear. The life of the barrel is provisionally estimated as 500 to 600 rounds.

The shield is composed of 2 1/4-inch plates bolted together with the barrel installed in a ball mount.

The elevating mechanism, of the sector type, is on the right-hand side of the cradle. The traversing mechanism is of the screw type and is on the left. There is no equilibrator. The buffer is hydraulic, and the recuperator is spring type. The wheels are metal with solid rubber tires. Traction is motorized. The axle is under-slung with torsion-bar suspension, which is automatically cut out when the trails are opened. Pneumatic brakes, controlled by the driver of the tractor, are fitted.

b. Gun Data

Estimated muzzle velocity	4,123 f/s
Length of barrel (approx)	170 in
Weight in action	1.4 tons (British long)
Elevation	-10° to $+18^{\circ}$
Traverse	60°
Height of axis of bore at 0° elevation	34.6 in
Length of recoil (approx)	27.6 in

c. Ammunition

Fixed ammunition is used with an AP tracer projectile of Gerlich design (see accompanying sketch). The AP round is known as 7.5-cm Pzgr. Patr. 41 Pak 41 (Armor-piercing shell Model 41 for Pak 41).

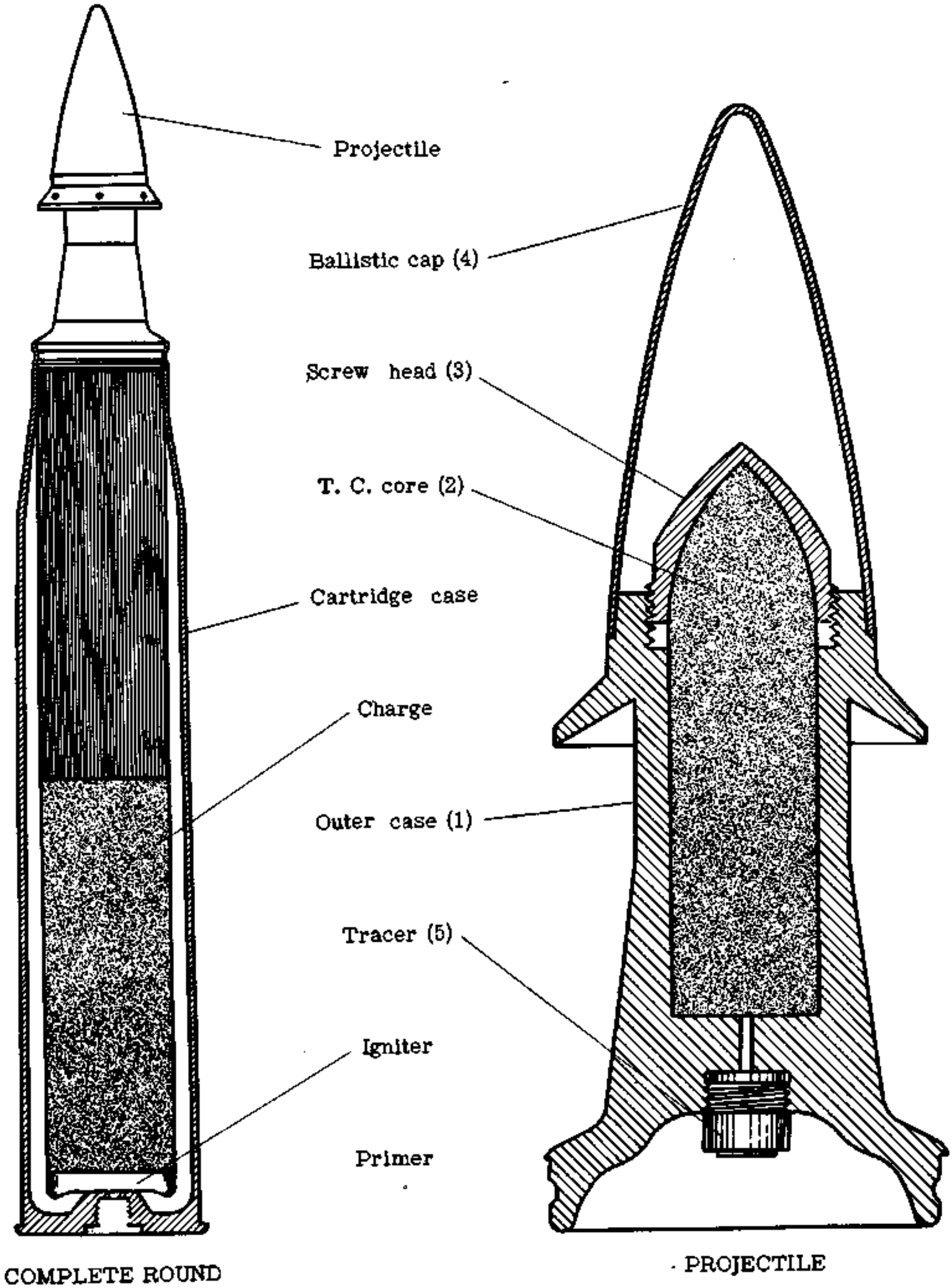
The projectile consists of the outer case (1), the tungsten carbide core (2), the screw-head (3), the ballistic cap (4), and the tracer (5). The outer case has a forward and a rear skirt. Only the forward skirt is perforated. The screw-head is made of mild steel.

The propellant charge is diglycol tubular powder, while the igniter is of pyroxylin porous powder.

There is also an HE round (7.5-cm Sprgr. Patr)(HE shell Model 41 for Pak 41) as in the cases of the 2.8-mm s.Pz.B (antitank gun) 41 and the 4.2-cm Pak 41, but no details of this ammunition are known.

The following are brief specifications of the AP ammunition:-

[redacted]



75-MM ARMOR-PIERCING AMMUNITION

[redacted]

Total weight of round	16.65 lb
Total length of round	29.8 in
Weight of projectile	5.68 lb
Weight of tungsten carbide core	2.01 lb
Diameter of core	1.16 in
Weight of propellant charge	5.4 lb

d. Penetration

The following figures for penetration of homogeneous armor by this weapon firing the AP projectile have been estimated:

Range (yards)	Thickness of armor in inches Normal	30°
500	(6.67 in)	(5.75 in)
1,000	(5.94 in)	(5.12 in)
1,500	(5.28 in)	(4.49 in)
2,000	(4.63 in)	(3.94 in)

ARMORED

5. GERMAN PZ KW 5--ADDITIONAL INFORMATION

The receipt of more recent information supplementing the data on the German PzKw 5 (Panther) tank as described in Tactical and Technical Trends No. 37, p. 5, makes it possible to furnish additional details.

The overall appearance of the Panther closely resembles that of the Soviet T-34, particularly as to inclined armor plate, cone-shaped turret and Christie-type suspension wheels. It should be emphasized that the type and arrangement of driving sprockets and bogie wheels is one of the most important aids to prompt identification and destruction of enemy tanks (see reference p11, armor skirting on German tanks).

By American standards, the Panther should be classed as a heavy tank, not a medium.

a. Dimensions

(1) Lengths

Overall length, including gun	29 ft 1 in
Overall length, excluding gun	22 ft 7 1/2 in

Length of hull	22 ft

(2) Widths

Overall width	11 ft 3 in
Width over tracks	10 ft 9 in
Width of superstructure	9 ft 9 1/2 in
Width of hull	6 ft

(3) Heights

Overall height	9 ft 6 1/2 in
Ground clearance	1 ft 7 in

(4) Diameters

Inside diameter of turret ring	5 ft 5 in

b. Armor

Position of Plate	Thickness	Angle to Verticle in Degrees
(1) Turret		
Front (including gun mantlet)	3.93 in	0
Sides and rear	1.77 in	25
Roof	.66 in	90
(2) Hull and Superstructure		
Front nose plate	2.95 in	53
Driver's front plate	3.34 in	57
Superstructure sides	1.77 in	42
Hull sides	1.77 in	0
Tail plate	1.77 in	30
Belly plate	.66 in	90
Skirting plates	.19 in	0

The armor appears to consist of rolled plate except for the gun mantlet which is a casting. The skirting plates extend down to about 30 inches above ground level.

c. Armament

The armament consists of one 75-mm tank gun Kw.K 43, turret mounted, one 7.92-mm machine gun, coaxially mounted; and six electrically-fired smoke projectors in two sets of three on either side of the turret. The 75-mm tank gun

[redacted]

is a straight-bore weapon having a muzzle brake with an overall length of 18 feet 2 inches.

d. Suspension

Front sprocket drive, large, disk-type interleaved, rubber-tired bogie wheels on eight load-carrying axles each side of the tank. Independent torsion bar springing. All units are fitted with shock absorbers.

e. Track

Track width	2 ft 2 in
Pitch of track	6 in
Diameter of track pin	0.9 in
Links per track	86
Ground contact, front to rear bogie wheel centers	12 ft 9 1/2 in
Ground contact by measurement on ground	13 ft 5 1/2 in
Width of track between centers of track plates	8 ft 6 in
Width of track between edges of track plates	10 ft 8 in
Track pressure (Russian report)	11.7 lb (per sq in)

f. Miscellaneous data

Ammunition carried	75 rounds of 75-mm (2.95 in) shells, 2500 rounds of 7.92 mm (MG)
Sighting arrangement	Binocular sighting telescope on left of 75-mm gun
Gasoline (2 tanks) capacity	165 gals
Ventilation	An electric fan in the turret roof above the coaxial machine gun.
Pistol ports	One in each side and one in rear of turret.

It has been reliably reported that due to the angle at which the armor is placed (practically none of the armor is vertical) the Panther is the most formidable of German tanks.

[redacted]

6. ARMOR SKIRTING ON GERMAN TANKS

From both Allied and German sources, reports have come in of additional armored skirting applied to the sides of German tanks and self-moving guns to protect the tracks, bogies and turret. Photographs show such plating on the PzKw 3 and 4, where the plates are hung from a bar resembling a hand-rail running above the upper track guard and from rather light brackets extending outward about

18 inches from the turret. What appeared to be a 75-mm self-moving gun was partially protected by similar side plates over the bogies. This armor is reported to be light -- 4 to 6 millimeters (.16 to .24 in) -- and is said to give protection against hollow-charge shells, 7.92-mm tungsten carbide core AT ammunition, and 20-mm tungsten carbide core ammunition. This armor might cause a high-velocity AP shot or shell to deflect and strike the main armor sideways or at an angle, but covering the bogies or Christie wheels would make the identification of a tank more difficult, except at short ranges.

[redacted]

ARTILLERY

7. GERMAN 12-CM MORTAR BATTALIONS

Translation of an incomplete German document, which was obtained from a reliable source, gives the following information about the motorized German 12-cm German Heavy Mortar Battalion.

These battalions appear to be G.H.Q. troops which may be attached as desired. They combine great fire power with considerable maneuverability. When it is necessary to operate off roads, the mortars can be carried for short distances in three loads, therefore they can support the infantry everywhere. As only high angle fire is possible, the mortars must always be placed in positions from which they can take advantage of cover afforded by defilade.

The fire unit is the platoon, the tactical unit may be either the company or the battalion. To build up an especially effective fire concentration, the battalion can be employed complete, fire being coordinated by the battalion commander. In this way it is possible to produce great intensity of fire so that, for the tasks of breaking through fixed positions or overcoming particularly obstinate defense, the battalion is especially suitable. Breaking up the battalion into units smaller than company, diffuses and lessens the effectiveness of the fire.

The battalion is organized as follows:

Battalion headquarters, with signal sections
Ammunition platoon and train
Three heavy mortar companies.

Each company is equipped with 12 mortars and 3 light machine guns for local defense and antiaircraft fire. Battalion headquarters has 6 radio sections with which the companies and also the forward observation posts can be linked. In addition there is a telephone section which can connect 5 separate points.

For communication with their platoons, companies have 3 radio sections and 2 telephone sections so that when 1 platoon is within calling distance of the company command post, the 2 other platoons can each have both radio and telephone communication, and a radio section remains available for a forward observation officer. For communication between observation point and fire position, each platoon has a telephone line and a field radio set. Or alternatively, if double communication is not required, a forward observation officer can be supplied with radio or telephone.

The battalion is equipped with trucks which have only a moderate cross-country performance. For this reason the routes of approach to the position, and particularly to the actual firing positions, must be carefully reconnoitered and sign-posted.

The best range for the 12-cm mortar is between 2,200 and 3,800 yards. Maximum range is 6,500 yards.

[redacted]

When fitted with percussion fuzes, the mortar shells have a good splinter effect. Splinters fly almost horizontally over a large area.

The almost silent flight, the dull thud of the impact, and the air compression when the shell bursts, produces considerable adverse effect on the morale of troops. Naturally, the effect is heightened when the mortars are mass fired. In view of these effects and the destructive power of the shells, the heavy mortar battalion is especially suited for attacking dug-in positions, objectives in hollows, villages and wooded areas.

Generally 12-cm mortar battalions are attached, as army troops, to large units on the march, or else they are ordered to proceed independently to a unit which they are to support in a particular action. When in support of an infantry division, the battalion moves by bounds, either with the motorized elements of the division or alone. When action with an advance guard is necessary, the principles for employment of motorized artillery apply. When in support of a motorized division, the battalion can be allocated to the advance guard.

In the preparation of an attack, the battalion is to be used as a complete unit at tactically important points. In such cases, the battalion is subordinated to an infantry regiment.

Employment of the battalion depends on the distance from the enemy. If the assembly takes place at a great distance from the enemy, the battalion takes position right forward. It advances, whenever possible, on the heels of the leading infantry. Company and platoon commands maintain contact with the unit in front and report back on the possibilities of action.

8. STORAGE OF AMMUNITION DURING RAINY SEASONS

It is important that special attention be given to the storage of ammunition during rainy seasons. If the necessary material for stacking and covering the ammunition is not available, it must be buried. However as there is danger of the pits being flooded, the following precautions are recommended in a translated enemy document.

*　　　*　　　*

(1) The pits must be dug deeper than required and filled to the required level with rubble.

(2) The ammunition should not come into contact with the sides of the pit.

(3) The top should be covered in as far as possible with old tarpaulins, etc.

(4) If there is danger of the pit flooding, the ammunition should be taken out, even if it is still raining. Separate charges must be given first preference.

(5) The ammunition should be examined when the rain has stopped, but air-tight containers which are intact must not be opened. Damp ammunition should be treated according to instructions, but it should not be exposed to the sun directly as it will become moist again when it is put back into a cool pit.

CHEMICAL WARFARE

9. USE OF SMOKE BY GERMAN AIR FORCE

Various German documents which have become available for examination reveal much information concerning the tactics, and apparatus employed by the German Air Force in the use of smoke. It will be noted that German and American smoke tactics are similar in many respects.

The following information obtained from German documents, was compiled in the Office of the Chief of Chemical Warfare,

* * *

a. Weapons and Objectives

Aerial smoke apparatus can be used to establish smoke screens (a curtain of smoke extending down to the ground) and area screens (a smoke cloud extending close to the ground and covering a given area). At present, smoke does not appear to be a suitable weapon for aerial combat.

Ordinary screens are established by a single aircraft or by several aircraft following each other. Area screens, on the other hand, are produced by a number of aircraft flying in close proximity. Two means of dissemination from aircraft are available.

(1) Spray Apparatus -- Under air pressure, smoke acid, which is either sulfurtrioxide or chlorsulfonic acid or a mixture of the two, is sprayed from tanks attached to the plane. By experiments it has been found that planes spraying smoke should fly at altitudes of 130 to 165 feet or less. Another German source states that the minimum altitude for smoke cloud emission is 100 feet.

(2) Smoke Bombs -- Smoke bombs are used for establishing screens from high altitudes. Usually the filling is either smoke acid or a Berger mixture consisting of powdered aluminum and hexachlorethane. Release by aircraft is the same as for HE bombs.

[redacted]

b. Atmospheric Conditions

Proper evaluation of weather conditions determines the effectiveness of smoke screens produced by planes. The following data have been ascertained by experiment:

(1) Very Favorable Weather--No wind or light wind, high humidity, atmospheric conditions of early morning and dusk, also night time.

(2) Favorable Weather--Wind velocity from 4 to 16 mph for spray dissemination, 7 to 13 mph for smoke bomb, temperature not below 23° F, overcast sky.

(3) Unfavorable Weather--Wind and sunlight cause convection currents ("noon weather"). Very strong wind and squally weather cause drifting and scattering of smoke. Following a dry cool night, sunlight, and medium strong wind will cause rapid dispersion of cloud ("Forenoon weather"). Heavy frost and low atmospheric humidity result in poor smoke cloud formation. Smoke dissemination may be made effective under unsatisfactory weather conditions by an adequate increase in expenditure of smoke agents.

c. Tactics

Surprise is an important factor in the use of smoke. Consequently in defense, enemy smoke on one's own positions is an imperative signal for the dispatch of one's own aerial reconnaissance. Situations which permit the use of smoke by aircraft are:

(1) Attack on Ground Targets--In HE bombing or in strafing attacks, smoke-disseminating planes can be used to blind or neutralize the aimed fire of enemy antiaircraft batteries and thus reduce the danger to the attacking planes. However, premature employment of smoke in such cases may enable enemy planes to intercept and thus jeopardize the effectiveness of the smoke on the antiaircraft positions. The further danger exists that smoke may conceal the actual objective of the friendly planes which are attacking.

During night bombing, the use of smoke may decrease the effectiveness of enemy searchlights as well as their antiaircraft fire. Diversion screens may deceive the enemy as to the true objective of the attack.

(2) Antiaircraft Defense--For screening of important installations, including airfields, aircraft factories, arsenals, business and industrial centers. This use requires an adequate service to warn of approaching enemy planes and a system to enable rapid response.

Area screens laid by aircraft can hamper the orientation of enemy aircraft with respect to their objective by covering an area considerably larger than the specific target. Dense masking screens may be established by mass employment of smoke. (However, in practice, the Germans seem to depend on ground means of dissemination for area smoke screens.) Even light smoke screens may suffice to

[redacted]

render orientation difficult, but they possess the disadvantage of being rapidly dissipated. Thorough preparations are required to co-ordinate use of area smoke with antiaircraft defenses.

(3) In Support of Ground Forces--Thorough preparation and perfect co-ordination with the ground forces, including a reliable communications system, are necessary. Consideration must be given to the necessity of not interfering with one's own aerial combat reconnaissance. These are some of the tasks that may be undertaken:

Observation posts of enemy artillery and machine gun emplacements may be blinded by smoke bombs. Flanking fire from sectors outside the main line of attack may be neutralized by smoke sprayed from low-flying aircraft. This can be particularly valuable in facilitating movement of units within the area under enemy observation either in attack or defense.

Similarly, to break off combat, and during withdrawal, smoke may be placed on the enemy to delay his movements and enable one's own ground troops to withdraw with a minimum danger from effective enemy fire. Consideration must be given to the possibility that smoke may limit or neutralize one's own aerial defenses and may interfere with operations in adjacent sectors as a result of drift.

d. German Aircraft Smoke Bombs

The following table identifies and describes two of the smoke bombs used by the German air force. It is probable that other bombs are available and that they may be encountered. For a detailed description of the NC 50 bomb, see Tactical and Technical Trends, No. 29, p. 27.

Bombs

Type of Bomb	NC50	NC250-S
Employment	On land	On land and at sea
Weight	110 lbs	418 lbs
Dimensions	2'2-1/2" x 8" diam	------
Markings, color	Nose-white; body-aluminum color with 4 white bands, 1 in wide	------
Ballistics and suspension	Same as for SC50*	Same as for SC250
Fuze	Mechanical tail fuze	Electric contact fuze (Zd. 26)
Duration of smoke cloud	30 to 40 mins	2 to 3 mins

*See Tactical and Technical Trends, No. 37, P. 27.

e. Comments

Doctrines set forth by the Germans in the documents under review are for the most part standard practice. It is questionable, however, whether the use of smoke-spraying aircraft to produce large area screens is anywhere nearly as effective as ground installations for this purpose. Actual German practice seems to confirm this.

Direct spraying of smoke on enemy ground units by low-flying aircraft to prevent flank fire during an attack would seem to be questionable tactics. The smoke-laying aircraft would be extremely vulnerable in such an operation. However, it may be intended to lay smoke in an adjoining area which will drift over the units which it is desired to blanket.

During the Grecian campaign smoke was at times used by the Germans to indicate targets. Reconnaissance planes would lay down a streamer of smoke to indicate the direction of the targets. In one case a German aircraft circled a camouflaged airfield and laid down a smoke trail. In another, a winding road was outlined for several kilometers by smoke placed over it by two reconnaissance bombers. Following shortly, 20 bombers flew over the smoke trail, 10 on each side, and dropped their bombs.

10. SMOKE GENERATORS -- GERMAN 8-WHEELED ARMORED CAR

A German eight-wheeled armored car (see Tactical and Technical Trends No. 32, p. 8) recently examined was equipped with two smoke generators. The discharger cups were fitted to either side of the turret on brackets, pointing forward, upwards and outward. In the bottom of each cup was fixed the bolt of a standard German carbine, controlled by a cable and trigger mechanism from inside the car. A blank cartridge projected the smoke generator, which, from the dimensions of the cup -- 6 inches in length and 3.61 inches internal diameter -- was the standard German Nb.K. (Nebel Kerze--smoke candle) 39.

ENGINEERS

11. NOTES ON APPLIED CAMOUFLAGE

a. Report From Attu

In camouflage, as in all other matters, there is a wide difference between theory and practice. To the question, "What camouflage technique proved most

effective as used by you?" four Attu casualties, all enlisted men, replied, "We were too busy fighting to have any time to worry about camouflage." However, further inquiry disclosed that moss was put on the helmet-nets and mud on their faces. A white sheet was effective on a snow background--when not used to clean rifles--and a reversible parka, brown on one side, white on the other; was effective among rocks with patches of bare snow among them -- a hospital tent camouflaged with the combination of chicken feathers on wire netting was practically invisible a few feet away.

Soldiers reported that the use of tracer bullets served only to give away a position. The Japanese did not use them. The Japanese, particularly when they held the higher ground, hid their trenches and fox-holes by covering the mound of excavated dirt very carefully with tundra. From a lower elevation, it was practically impossible to see such a foxhole. They too, used the white-sheet camouflage in the snow. Grass was used to camouflage buildings.

b. German Practice in Africa

(1) General

In Tunisia, the Germans sited positions for concealment even when it meant overcoming considerable natural difficulties. While they used no special camouflage tactics with which we are not familiar, nor possessed any equipment superior to our own, their camouflage discipline was excellent. Tracks and litter were kept well under control. The use of alternative positions for mobile equipment was general. The nets used to cover their vehicles were lightly garnished, and employed for the most part to support brush or other local material threaded in.

(2) Artillery

Artillery camouflage was unusually good, with brush-wood hedges as the principal material. Guns so protected were hard to spot, as the German powder, while it produces a flash, is quite smokeless. In settled communities, guns would be placed in gardens or private houses; carefully covered with shrubbery, they defied anything but almost point-blank observation from both air and ground. At Bizerte, bamboos, iron-shod at both ends were found upon which netting was stretched and used to cover emplacements. These frames were of different sizes and worked on simple hinges around the emplacements so that they could be quickly pushed off the guns or swung back into position. Local foliage supplied the garnishment. No camouflage was wasted on targets located on conspicuous landmarks such as those in Bizerte harbor.

c. German Airfield Camouflage

(1) Runways

There is no stereotyped layout for German advanced landing fields. Of those inspected, as little as possible had been done in order not to disturb the ground surface. In only one had attempt been made to level the site and here, light

[redacted]

scraping and harrowing had been done through the various crops. No runways had been cut or tracks laid--the crops had not been destroyed -- only their growth was retarded. An air reconnaissance proved that the runway so prepared was very difficult to spot.

(2) Dispersals and Blast Pens

Dispersal was over a large area and blast pens were almost always used. Two or three were usually placed adjacent to the landing strip within easy access. Located in banks or on a hillside, or among olive groves according to the country, the rest were dispersed over a wide area. On one airfield, the dispersal was carefully concealed around a large grove with the airplanes pushed in between the trees around the edge. Air reconnaissance showed that well located blast pens were not easy to distinguish.

d. Decoys

The use of dummies and decoys is as old as warfare. In Tunisia, there is evidence that German dummy positions successfully drew our fire. In Attu the hoary trick of holding up a helmet to draw fire produced no results and the only successful decoys were our junior officers who exposed themselves to draw fire. The Japanese did the same, to focus attention on one position or foxhole while others were moving to some other location.

12. ENEMY BOOBY TRAPS RECENTLY ENCOUNTERED

A war correspondent who covered the campaigns in Tunisia and Sicily recently warned those who expect a spectacular Allied march on Berlin, that the road will be literally paved with land mines and booby traps. The following samples of unusual Axis booby traps have been recently encountered.

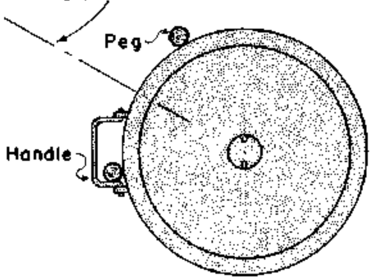
A tellermine was found balanced on one branch of a tree by means of a long stick. A pull igniter was attached to a second branch, the idea being that someone would remove the stick that balanced the tellermine, thereby allowing the mine to fall and explode in the air.

In another instance a hole was dug the required depth and size for a tellermine and a peg with a nail in it was driven into the bottom of the hole. A short loop of wire was fastened to the igniter in the bottom of the mine; the mine was then placed in the hole and the loop of wire fixed over the nail on the peg. The mine was then turned around the peg, thereby wrapping the slack in the wire around the peg until there was no play in the wire. A peg was driven through the handle of the tellermine to hold it in position. The safety pin was pulled out so that the pull came against the pegs (see sketch) and prevented any movement which might have detonated the mines.

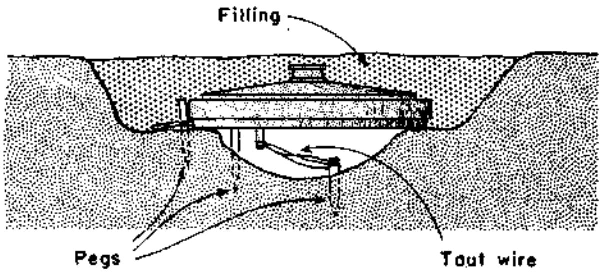
[redacted]

Had the pegs at the side not been noticed, it might have been assumed that no trip mechanism had been fitted underneath.

A 3-kg (about 6 pounds) charge was found with a pull igniter attached to the carrying straps in such a way that anyone lifting the charge by the straps, would set off the mechanism.



PLAN



SECTION

Perhaps the most unusual instance was that of a cake of soap taken from a German gas mask case. An examination disclosed that while this soap bore the brand of "Bourjois" it did not have the characteristic perfume, but on the contrary resembled common washing soap. A concussion charge was fired 6 inches away from a can of water containing the soap. This resulted in a sympathetic detonation of extreme violence, blowing the bottom of the can away, but hardly damaging the side of the can between primer and soap. The odor of the fumes resembled those of polar Gelignite*.

13. GERMAN ARMORED PORTABLE PILL BOX

A new type pill box, called the "Armored Crab" by the Germans, is now in action on many sectors of the Eastern front. These pill-boxes are of steel construction, painted grey and are dome-shaped. They are mounted on wheels (see accompanying figures 1 and 2), in an inverted position, and may be quickly moved from one position to another, usually by tractor. They carry a crew of two men.

a. Construction

Overall height	6 ft
Height of upper part above ground	3 ft
Width	5.6 ft
Weight	3 tons

*A moderately fast-burning British explosive for bore-hole charging and blasting.

[redacted]

b. Thickness of Armor

Level with embrasure	5.46 in
Below embrasure	3.51 in
Sides, rear and top	1.56 in
Lower section and floor	.39 in

c. Embrasure

The pill box has a small embrasure with an observation peep hole above it. When necessary the embrasure may be covered by a large triangular armored slide which can be moved either to the right or left of the embrasure and is operated by a handle on the inside. On the top of the pill box are two collapsible periscopes also regulated from the inside. The entrance to the pill box is through a small trap door in the rear which has two levers for closing it from the inside.

d. Armament

The armament is an MG-42 or MG-34 machine gun mounted on a special type stand. The machine gun is elevated or depressed by an elevating hand wheel. It moves horizontally along a frame which is attached to the inside walls of the pill box - the field of fire through the embrasure being 60 degrees.

e. Emplacement

These pillboxes are usually situated in the second defense zone. It takes fifteen men to change one from traveling to firing position. When it is emplaced, the usual procedure is to dig a hole and sink in the entire lower section and part of the upper section (see figure 3). The upper part does not rotate so that only the machine gun aperture in front and the opening in the rear with the two periscopes and the pipe on top must be exposed.

f. Operation

Under combat conditions the observer looks through one of the periscopes to observe and direct the gunner's fire. The gunner observes through the forward slit. Protection from the front against rifle, grenade and artillery fire is by means of the iron slit cover which is manipulated to cover or open slit from the inside. Inside the pillbox there is sufficient room for both members of the crew to sit comfortably and move around to a limited extent. There is a small heating stove and a ventilating apparatus, operated by a foot pedal, which provides sufficient changes of air when all vents are closed. There is enough ammunition for 5 to 10 hours of fire.

g. Methods of Combatting

As only about one yard of this pill box shows above the ground, it is very difficult to detect. Thorough reconnaissance is imperative. It can best be detected by the outline of its embrasure, by its periscopes, flue pipe, and flash and powder

[redacted]

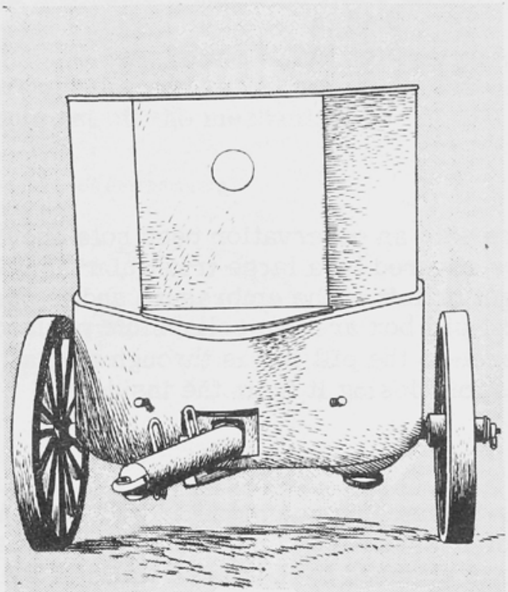


FIG. 1

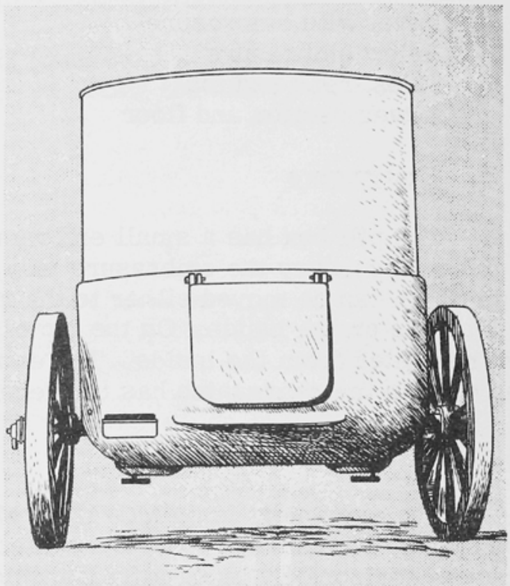


FIG. 2

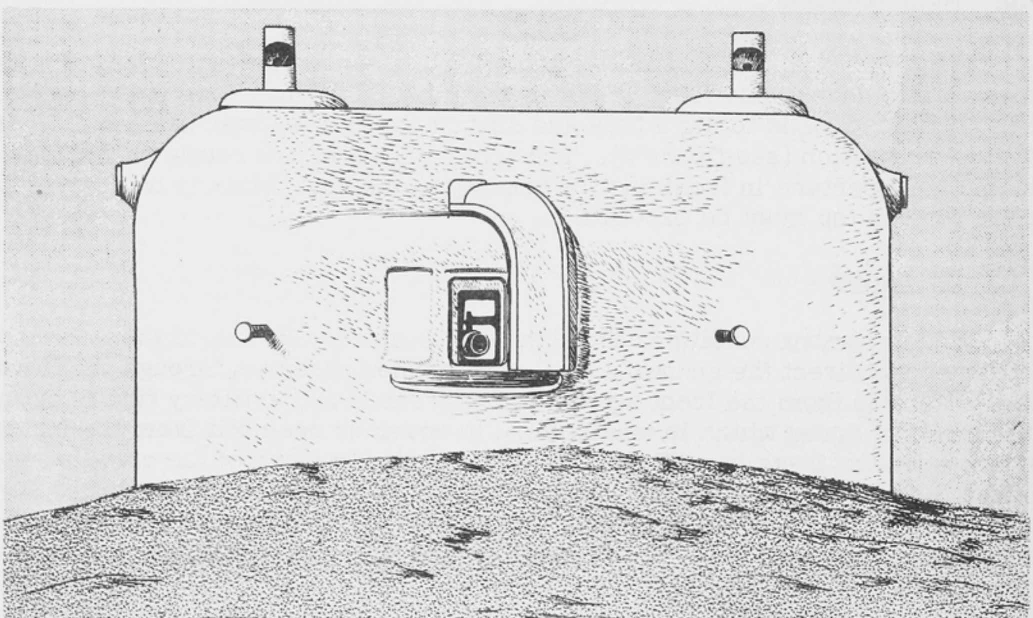


FIG. 3

GERMAN ARMORED PORTABLE PILL BOX

smoke from the machine gun when fired.

Riflemen or mortar squads should demolish the periscopes, thus leaving the crew without means of observation. Rifle shots should be aimed at the embrasure. In a number of captured pill boxes, armor-piercing rifle bullets had made holes in the lower part (the walls of the base). Such fire is effective only if this portion has been uncovered by artillery fire or if it was not completely covered with earth when the pill box was emplaced. Antitank guns should aim at the sides of the pill box about 20 to 24 inches from the top, since the thickness of the armor there is only one inch. The most practical method of destroying these pill boxes is point-blank fire by antitank or artillery guns.

Since the field of fire is only 60 degrees, separate pill boxes may be destroyed by assault troops moving in on the vulnerable and unprotected sides and rear. As a rule these pill boxes are used in groups, but by neutralizing the supporting pill boxes it is possible to isolate any particular one.

When assault troops come up to these pill boxes, they should first cover the embrasure with earth and throw hand grenades at the trap door in rear. If the crew refuses to surrender, the pill box should be blown up. In attacking these pill boxes Molotov cocktails may be used against the periscope openings. If no explosives or gasoline bottles are available, in addition to covering the embrasures with earth, the trap door should be wedged with stones or logs to put the pill box out of action.

INFANTRY

14. THE JAPS AT BUNA

The following observations are quoted from an interview with an infantry officer who recently returned to the United States from the Southwest Pacific theater:

"The only enemy installations I saw were on the outskirts of Buna Village (between late November and 7 December 1942.) The Japs were comfortably quartered in semipermanent structures, made in the usual native design, with a pole frame, canvas roof and mosquito netting enclosing the interior. Board flooring further bug-proofed the houses and provided sleeping accomodations above the level of pools caused by rainfall. Dugouts, surrounding the structures, formed a defensive ring around the area of living quarters. These defenses were supplemented by installations extending to Buna village and Buna Mission.

"The Japanese defense installations were excavations, four to six feet in depth. They were covered with palm logs (generally more than 12 inches in diameter) and earth. The sides of the dugouts were usually reinforced with boards, sandbags or logs. Firing slits were provided for rifles and automatic weapons, fire lanes had been prepared, and the whole artfully camouflaged.

"These installations were practically impervious to the Australian 25-pounder artillery fire and our own 81-mm mortar fire. (See <u>Tactical and Technical Trends</u>, No. 31, p. 31 for additional information on these bunkers and dugouts.) However, I have been told that our 37-mm gun, firing the cannister shell, has been effective against the Jap emplacements. Also it was noted that these dugouts were open in the rear and thus were vulnerable to attack with hand grenades.

"The troops opposing us were Jap marines. They were disposed to defend Buna Village, Buna Mission and the nearby airstrips.

"The Jap has definite characteristics. He is not too willing to die for his Emperor when the odds are against him, and he will squeal like a pig when he is routed. He is crafty and takes full advantage of his surroundings to improve his position; he is a master of the art of camouflage; he will wait hours for a target; he will use decoys to draw and disclose fire; he takes delight in plaguing inexperienced troops with so-called "explosive bullets" which he fires into tree tops to the flank and rear of opposing positions; he also uses other noise-making tricks to bewilder his enemy. His attitude early in the Buna campaign was almost entirely defensive but he fought with dogged determination while he considered that he had a chance."

15. GERMAN CLOSE-QUARTER FIGHTING AND WITHDRAWAL

During the Sicilian campaign, perhaps the best example of German tactics in close-quarter fighting and withdrawal was furnished in the Battle of Primosole.

After the initial assault by Allied troops on the morning of 15 July 1943, which was brought to a standstill, the Germans made no attempt to defend the river line but concentrated on holding a position in the vineyards and ditches on each side of the road, north of the bridge. This position was based on a sunken track which afforded cover from view and in the banks of which shallow trenches were dug. The track ran west from the main road about 200 yards north of the river. The Germans also made much use of ditches running east and west from the main road. Pillboxes in the area were not used by the Germans as they had been engaged by .75-mm gun fire from Allied tanks.

The Germans were equipped with a very high proportion of automatic weapons, particularly light machine guns. During the night fighting, light machine guns fired on fixed lines very close to the ground, causing wounds to feet and legs and preventing crawling. The fire was coordinated with the firing of flares. Bursts of 10 to 15 rounds were fired at a rate of one burst about every minute.

In daylight, machine guns were well concealed in commanding positions in ditches and along the sunken track. Much use appeared to be made of alternate and supplementary positions, for each machine gun appeared to fire first from one location and then another. Never more than two or possibly three machine guns were firing at any one time, giving the impression of a very small force, whereas in the length of the sunken track alone (from 200 to 300 yards) the number of rifles and

[redacted]

other weapons counted and the number of prisoners taken showed that there were at least 50 to 60 men.

Individual snipers armed with light machine guns, sub-machine guns or rifles were concealed in the vineyards and trees forward of, and on the flanks of the Germans' main position. The mission of these snipers was probably to protect the German flanks and to serve as a nuisance against Allied troops.

During the first part of the battle the Germans had very few mortars. Only one is known to have fired, and its fire was inaccurate and did not appear to be observed, probably because of the closeness of the fighting.

Grenade throwing pistols and rifle grenade dischargers, both types of weapons throwing a high-explosive grenade approximately 20-mm in diameter, were used at close quarters to put down a heavy concentration of HE. Many stick and egg grenades were also used.

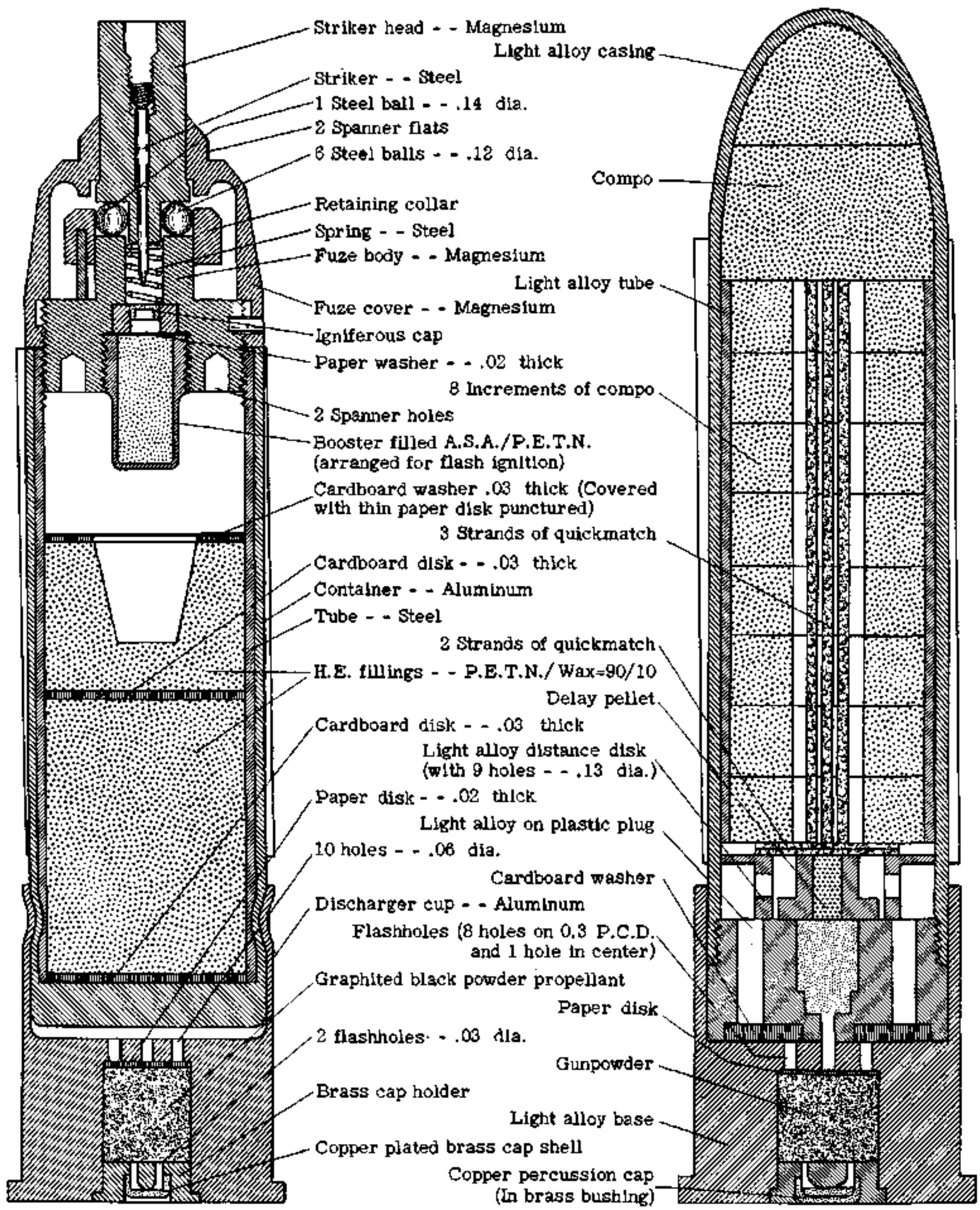
The Germans had four or five 88-mm guns and one or two antitank guns of small caliber, 20 mm or 37 mm. These guns were used principally to cover the main road. No attempt was made to conceal them, probably because they were brought up in great haste, when the Germans discovered the presence of Allied tanks and realized that bridge demolition work was impossible. But demolition charges and magnetic antitank grenades were used by individual Germans who concealed themselves in ditches by the side of the road and in culverts under the road and engaged our tanks at close quarters.

The German withdrawal from their defense position was at the rate of five to six miles daily, each movement being to a previously selected position. Such positions were chosen for their commanding nature, affording good fields of fire for machine guns and good observation posts for mortars. Sometimes they were based on natural antitank obstacles such as river beds. Towns and villages were not used as centers of resistance except where commanding positions over a bottleneck could be obtained by occupying houses on high ground. On one occasion the Germans occupied a line of houses built on a very high ridge. A sunken road behind the houses provided good lateral communications and a covered line of withdrawal.

Patrol reports and reports from civilians indicated that the Germans usually withdrew in the early morning, between 0200 and 0400 hours, the last elements to leave often being covered by a few tanks. The Germans gave no sign of their withdrawal, such as increased shelling and machine-gun fire at the end of day and intervals during the night. Such fire had marked their withdrawals in Africa.

[redacted]

FIG. 1 FIG. 2



GERMAN GRENADE PISTOL AMMUNITION

[redacted]

ORDNANCE

16. JAPANESE 81-MM MORTAR AMMUNITION

Test firing has demonstrated that Japanese 81-mm mortar ammunition is completely interchangeable with US ammunition when fired in the US 81-mm MI mortar. Slightly shorter ranges are obtained with the Japanese ammunition.

17. GERMAN GRENADE PISTOL AMMUNITION

Recent reports show that four types of ammunition are furnished to German troops for use with the 27-mm (1-inch) Kampfpistole (grenade pistol). The four types of projectile are, respectively, HE, smoke, a so-called "indicator" grenade, and a grenade which, in flight, ejects an illuminating star attached to a parachute. For previously published reference to the German 1-inch grenade pistol, see Tactical and Technical Trends, No. 27, p. 31.

Detailed information concerning Kampfpistole ammunition follows:

a. HE (Sprengpatrone für Kampfpistole)

This is a small, nose-fuzed high-explosive round, relying on blast for its effect. However, since the effect is comparatively small it is believed that this round is essentially offensive ammunition, preferably for use in street fighting.

The small prismatic sight on the pistol is graduated to 100 meters (approximately 110 yards) and although tests have shown that longer ranges may be obtained, such shooting is inaccurate.

A general description of the grenade is shown in fig 1 (see accompanying sketches). Other details are:

Weight of complete round	Approx 5 oz
Weight of projectile	Approx 3 1/2 oz
Type of filling	PETN/Wax (pental erythritoltetranitrate)
Weight of filling (2 increments)	339 grains
Type of propellant	Graphited black powder
Weight of propellant	12 grains*
Markings	Base of cartridge case usually stencilled: "Spr. Z".

b. Smoke (Nebelpatrone für Kampfpistole)

Externally this is similar to the HE projectile; internally it contains a smoke generator. It is fitted with a nose fuze which is similar to that in the HE

*This propelling charge appears to be extremely small but the weight stated is correct according to the best available source information.

[redacted]

projectile, except that there is a charge of gun powder in place of the detonator below the flash cap. The projectile functions on impact. The gunpowder is ignited by the flash cap and blows off the smoke generator, at the same time igniting it. It has been ascertained that the smoke generator may be projected a considerable distance from the point of impact. The projectile may be recognized by the following stencilled marking on the base of the cartridge case: "NEBEL Z".

c. Indicator (Deutpatrone für Kampfpistole)

This grenade (see fig 2) emits a puff of reddish-brown smoke after it has been in flight for about two seconds. It is similar, externally, to the two grenades described above except for the head which is parabolic. There is no fuze, the smoke train being fired by the flash from the propellant.

Weight of complete round	Approx 4 1/2 oz
Weight of projectile	Approx 3 oz
Marking	Base of cartridge case stencilled "Deut. Z".

d. Illuminating Star on Parachute (Fallschirm Leuchtpatrone für Kampfpistole)

This grenade has the general external appearance of the other types. It has a black bakelite head which has a white spot in the center. "F. Leucht. Z" is stencilled on the base of the cartridge case. The base of the projectile has a screwed-on plug which is perforated to hold a gunpowder pellet. Above this is a star to which a parachute is attached. The parachute is towards the forward end of the projectile. The action is as follows: On firing, the flash from the propellant ignites the gunpowder pellet which, after a brief delay, ignites the star. The bakelite head is blown off and the star ejected. The star is of the illuminating type.

18. GERMAN MODIFIED SIGNAL PISTOL

The Germans have recently modified their signal pistol (see Tactical and Technical Trends, No. 22, p. 38 and No. 27, p. 31) in order that greater accuracy may be obtained.

A folding stock has been fitted to the butt of the pistol by a bracket which is recessed to allow the pistol to be cocked. It is secured by a quick release clamp immediately behind the trigger guard and by a small milled head screw which engages into the pistol butt itself. The securing bracket is connected by means of a hinged bracket to a hollow steel bar 10 inches long, at the end of which is an adjustable leather padded butt.

A loose rifled liner slides into the barrel and is held in position by a lug which fits into a slot in the extractor groove.

A sighting gear slides over the forward part of the barrel and is secured

[redacted]

by two screws. The sights consist of a combined folding front and rear sight, spring-actuated, and mounted on a cylindrical sleeve which slides onto the barrel.

GENERAL

19. GERMAN EVACUATION ORDER -- SICILY

The order below - a directive to the Herman Göering Division dealing with the evacuation of Sicily - is a typical example of German efficiency, even in defeat.

* * *

Enclosure to Herman Göering Div Order No. 31/43, 2 Aug 43

Directive for Future Moves and Battle Actions in Sicily

1. No demolition and no road blocks are to be manned by Italian personnel. Officers in charge of battle groups are responsible for the enforcement of this order.

2. Every German soldier who is forced to take to the mainland must be in possession of infantry weapons. Apart from revolver and bayonet he will carry a rifle, sub-machinegun, pistol or LMG, with ammunition. In the case of squads, one heavy MG or mortar. These weapons are tickets for the ferry. Without those mentioned, soldiers will ruthlessly be prevented from crossing.

3. No Italian, whether civilian or soldier, may interfere in any way with the movement of the German armed forces. All Italian motor vehicles and heavy weapons will be ruthlessly removed from the roads. This does not apply to units which, as part of the division, have proved their worth in battle, and carry on the fight.

4. Isolated remnants of formations, platoons, and squads of any description are to be put under the command of local units. They will be made to form part of the current movement. Out-of-date orders are no longer valid.

5. Any motor transport, weapons or equipment that cannot be transported across to the mainland are to be completely demolished. Destruction by fire is strictly forbidden, since fires and traces of burning are liable to attract the attention of enemy aircraft, both by day and by night. Blowing-up is the most effective method of destruction, and will be applied to weapons as a matter of principle. Motor transport will be destroyed so as to put them out of action for a long time at least. (They will be blown up, magnetos removed, tires slashed, the ngine smashed, or the whole vehicle run over a cliff.)

[redacted]

6. The most rigid discipline is the main condition for the success of all future moves. Anyone not co-operating will be shot. Examples of individuals always work wonders.

7. All traffic control regulations come under direct orders of Div HQ. Whoever does not comply with regulations is subject to disciplinary action, vide paragraph 6.

8. Roads which because of enemy action have been blocked (bomb craters or demolished houses) must be made passable as quickly as possible, or diversions created and flagged (attention drawn to them) by drawing on the civil population and prisoners of war.

9. All personnel will carry haversack rations for 24 hours as well as iron rations.

SECTION II

FINNISH VIEWS ON SNIPING

[redacted]

FINNISH VIEWS ON SNIPING

The following excerpts from a translated German document give the views of the Finnish General Staff on Russian snipers, the general principles of sniping and the defense against sniping. The German translation of the original Finnish document was said to have been widely distributed by the German Training Command and can therefore, be considered as having been approved by the German High Command. A previous reference to German views on sniping will be found in Tactical and Technical Trends No. 29, p. 21.

*　　　　*　　　　*

a. Russian Training and Activity

This section is a Finnish summary of information derived from Russian sources pertaining to the training and activity of Russian snipers.

(1) General

As to moral and physical strength, the sniper must be a first-class fighter. Only a man utterly unafraid and imbued with the will to do his duty to the last, can measure up to such a task. During the attack his place is 10 to 15 yards behind the firing line; his task to lie in ambush for enemy officers and light and heavy machine gunners. In the defense his place is either on the ground or in a tree, preferably at the limiting points of the frontal sector or the open flanks. His task is the annihilation of enemy commanders and also soldiers about to execute special missions entrusted to them.

In patrol activity the sniper's place is in the center. When engaged, he withdraws slightly to the rear in order to be able to select his target better.

Snipers always work in pairs. One to observe with the binoculars and estimate distances, the other to fire. Their contact is either visual or by prearranged signals. They are supported by riflemen. Their alternative positions - there are several of them - are approximately 20 yards away from the firing positions. Of main importance in the selection of the positions are the field of fire and camouflage.

In order to be able to determine the location and nature of the enemy target by means of a few (very often barely noticeable indications) the sniper must possess a highly-developed sense of vigilance and faculty of observation.

It is claimed that in winter time a sniper discovered an adversary by his breath visible behind a stone or bush, and another behind a tree by some birds that picked up bread crumbs dropped by the soldier on the ground.

Especially in the defense, the sniper must possess patience and tenacity. He often has to watch hours on end for the appearance of an enemy observer in the slit of a pill box or a careless movement that betrays his presence in a trench.

[redacted]

The battle with the enemy is a continuous one decided by the one who makes the first careless move or fires the first premature shot.

The independent nature of his activity, the necessity of knowing how to take the best advantage of cover and concealment, and to fit himself into constantly (very often very swiftly) changing conditions make the sniper's thorough training in tactics a prerequisite.

He must be able in all situations to make a quick decision as to which of the enemy targets have to be eliminated first. Often he is entirely on his own and fights without contact with his command post.

The sniper must be thoroughly versed in the art of camouflage. Again, the use of firing tables, the calculation of errors, the making of map sketches, presuppose a sufficient amount of schooling and education.

(2) Replacements

Considering the fact that continual fighting often under severe conditions takes a high toll of both mental and physical energy and capacity, special attention must be paid to the proper clothing, feeding and rest of the snipers.

The training of new snipers should be in the hands of the experienced ones and should be conducted on the days when the latter are free from front duty.

(3) Reconnaissance Activity

For reconnaissance, snipers are to be employed solely for their own tasks. They are only to be attached to medium-sized reconnaissance parties and in pairs.

When the reconnaissance party advances, the two snipers follow the main body and observe distant targets. Sometimes it proves advantageous to use the snipers as a connecting link between patrols, committing them in the direction from which the enemy is expected to make his appearance. In this manner they help to support the points of the patrols and clear the way for them.

During combat the snipers take up positions from which they can actively further the development of the engagement. While the one selects moving targets, the other tries to put enemy gun nests out of action.

After having made a personal reconnaissance of the local terrain, the snipers continually change position, thus deceiving the enemy as to their whereabouts.

When breaking away from the enemy, the two snipers can be used together with automatic riflemen as security elements. Care has to be taken, however, in this case, to place the snipers somewhat apart, as automatic rifle fire will attract enemy fire.

[redacted]

(4) The Attack

For the attack, snipers are mainly employed to select such enemy targets as most impede the advance. Best results are obtained if they operate on the flank.

Snipers are not only to be given clear instructions as to their own positions and tasks when advancing, but also should be familiarized with the plan and object of the unit.

In the attack, snipers concentrate especially upon eliminating enemy officers, men directing enemy fire, automatic riflemen and antitank personnel. Should they not succeed in silencing these objects, they indicate by tracers their position to friendly MGs, mortars or antitank guns, and move without delay to alternate positions.

In case of counterattack by the enemy, the two snipers organize their activity as follows: one destroys enemy weapons, the other the man-power of the enemy, especially officers, automatic riflemen and sharpshooters.

The activity of friendly shock troops is to be supported by two to four snipers. Well-placed hits in enemy fire slits enable the shock troops to force their way into enemy emplacements.

(5) The Defense

The firing positions of the snipers vary with situation and distance from the enemy. During an engagement snipers are placed in the outpost line or even moved further ahead. If the fight is carried on over a short distance only, they may be moved even behind the M.L.R. provided there are commanding hills or elevations.

b. Finnish Observations

This section details Finnish combat experience with Russian snipers.

(1) Enemy Organization

The main factors contributing to the effectiveness of enemy sniper activity are first: a good weapon (rifle with telescopic sight) and secondly, the concentrated use of snipers in as large numbers as possible. It is true that the sniper contingent of a rifle company consists only of 3 to 5 men (formerly only 2) but to this have to be added the sharpshooters sent forward in support by the rear formations. As these reserves take part in the struggle and put up a good fight to make a name for themselves, a great deal of their own glory goes to the snipers of the units in the line.

As far as number and position of the snipers are concerned there have not been any hard and fast rules. Recently snipers have usually worked in small

[redacted]

groups (4 men) ; however, every man has his own post which he leaves within a given time to change over to another.

(2) Fixed Positions

The determining factors controlling sniper activity vary naturally from sector to sector, but generally it can be stated that the enemy very aptly takes advantage of local conditions and constantly keeps in mind that the secrecy of the sniper's hideout is of utmost importance.

Usually the sniper takes his stand in a well-camouflaged dugout or other covered position connected with the trench. However, there are also cases where snipers have been observed in open positions.

The covered positions and dugouts are provided with one or several small fire slits. The face of the sniper cannot be seen, and in winter only the appearance of a small whirl of snow in front of the fire-slit betrays the fact that a shot has been fired.

When operating from a dugout, the sniper aims sideways from the ordinary fire directions, probably to deceive the enemy or to provide cover for himself. In one instance snipers seem to have been posted in the background of the dugout or covered position firing through the openings of the front wall. This seems to be borne out by the fact that sometimes no sound of explosion was perceptible.

When posted in a trench the sniper observes through a very small, hard-to-find, fire-slit in the parapet. Once in a while they have been seen posted in front of or behind the trench, even on top of the roofs of dugouts probably to secure a sufficient field of fire in low terrain. On moonlit nights snipers have been observed in no man's land. Flares were then fired to illuminate the targets.

Houses and rubble furnish snipers with excellent hiding places, hatch openings in attics and cellars being used as fire apertures. Also by removing some bricks, slits for observation and firing have been created. Snipers have also hidden themselves in lumber-stacks and wood-piles. During the summer several snipers were shot out of trees. In winter, however, trees have been avoided by them.

The Russian snipers seem to execute their tasks with extraordinary patience and tenacity and seem to have excellent material at their disposal. This can be concluded from the fact that they were able to discern even the least movement at great distances and that they concentrated their efforts only upon well-selected, sure and visible targets. Generally speaking, they were interested only in sure targets. Also the cooperation between several snipers seems to be smooth and the allocation of the different phases of the work well-organized.

It seems that once in a while two snipers go after the same target, for it happened that two men walking side by side were hit almost at the same time. On another occasion, one of our [Finnish] snipers was taking aim at his opponent when another enemy sniper shot his rifle to pieces. The sniper's mate not only takes

care of the observation, but also the deception of the enemy. He tries by all conceivable means to lure lookouts and guards from their protective cover.

Enemy snipers have used "dum-dum" ammunition, which made it more difficult to locate the spot from which the shot was fired but easier for the enemy to observe a hit.

(3) Time of Activity

The activities of enemy snipers have been the liveliest on bright, sunny days, in winter after snowstorms when snowdrifts covered trenches and communication trenches. Also light snowfalls and dusk were selected by the enemy snipers to step up their activity, as then our men moved about somewhat more carelessly, but the enemy's telescopic sights still offered a clear enough view to secure a hit. Our mealtimes, too, when again our men dropped some of their watchfulness, were utilized. In daytime, snipers generally preferred the mornings and noon-time.

(4) Ranges and Performances

Depending upon the distance between the lines, the ranges run from 100 to 900 yards, but occasionally enemy snipers have tried shots up to 1,400 yards. The usual and most effective distance is 200 to 400 yards, but even at 600 to 700 yards the accuracy of fire has been fairly satisfactory.

The fire readiness and speed of fire have been good even on moving targets, a proof on the one hand of thorough training, and on the other of the indispensability of the telescopic sight.

The speed and accuracy of fire gave rise to the suspicion that snipers posted in buildings made use of special aids. The accuracy of the fire may be illustrated by the following examples:

At 200 to 400 yards several scissors telescopes and periscopes were smashed to pieces. One sniper shot down a small rock which had been placed in an observation slit three times in rapid succession.

When one of our MG platoon commanders lifted his hand just once above the snow-wall to repair the alarm wire a Russian sniper scored a hit on his hand at 100 yards. A sniper was hit several times through an observation slit fashioned into the snow-wall with a stick. Various objects lifted by our men above the parapet, as a trial, were generally hit. It also happened that Finnish observers behind periscopes, were shot at through the snow wall.

(5) Deception

Enemy snipers made use, among others, of the following methods of deception:

In order to induce our men to become lax in their watchfulness they leave

[redacted]

a position in our line alone for as many as 8 days.

The sniper's mate shovels snow from a pit for a while then raises a helmet above the parapet, or a sniper puts a helmet visibly into a fire slit and then opens fire from an alternate position. One sniper takes up position behind a rock, then the other moves a completely equipped dummy back and forth in the trench. By opening heavy fire in a certain sector the enemy tries to confuse our men and cause them to expose themselves. Long bursts of automatic weapon fire have been used for the same purpose.

c. Finnish Counter-Measures

Most of the losses from enemy sniper fire have been caused by carelessness, inept utilization of cover and concealment, use of dirty snow capes and caps, or by not wearing any suitable garment at all that would afford protection against detection in a given terrain.

These losses are a proven fact, and soldiers must be forced to do everything in their power to impede the activities of snipers.

The following counter-measures may be used among others:

(1) Careful movements and the taking of full advantage of the ground in the danger zone;
(2) The best of camouflage;
(3) Sufficient depth of trenches and appropriate danger signs in the trenches;
(4) Struts placed across the trenches to force the men to walk in a bent body position;
(5) Use of snow capes;
(6) Use of clean and complete snow suits in the front line;
(7) Careful selection of the fire positions and their thorough reinforcement (steel plates, sandbags) and camouflage;
(8) Frequent changing of observation points;
(9) Avoiding of unneccessary firing from observation posts and application of various proven methods of deception;
(10) Intensification of our own sniper activity by the use, for instance, of additional snipers from the reserve troops;
(11) Freeing snipers from other duties and continuing their training, especially with a view to improving their accuracy of fire;
(12) Organized use of other weapons against snipers who cannot be eliminated by our own snipers.

[redacted]

CORRECTIONS

No. 37, p. 6: The reference to the 75-mm gun as "probably the new Pak 41" was in error. The gun on this tank as stated on p. 9 of this issue is the 75-mm tank gun Kw.K 43.

SECTION III

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CORRECTIONS

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